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Conference “Innovative Development of Agrarian Business and Rural Areas” (IDARA) is to disseminate the findings of scientific research. Through scientific advancements, the yearly conference seeks to identify areas for improvement, support legislative reforms, and eventually help to improve business conditions and rural inhabitants' quality of life.

The organizing committee's strategic goal is to remain the premier annual conference for the state-of-the-art theory and practice of agribusiness development, innovation, management, and economics. This will be achieved by fostering excellence in scientific and applied research, as well as by facilitating expert and researcher interaction and exchange between scientific institutions, consulting firms, and business structures.

The IDARA conference seeks to bring together representatives of the international academic community (university professors, experts, researchers, doctoral students, undergraduates and others) and to create opportunities for interactive discussions, interpersonal exchange of experience, promotion of science and personal and collective affirmation.

The IDARA Annual Conference is committed to the highest standards of publication integrity and academic honesty. All activities related to the organization of the conference and the publication of the results are considering the good practices of leading scientific institutions. The organizing committee expects compliance with standards of ethical behavior from all parties involved: authors, editors, reviewers and publisher. Conference organizers follow Committee on Publication Ethics (COPE) guidelines on how to deal with potential acts of misconduct.

All received full papers are subject to a plagiarism check with StrikePlagiarism software – the program used at the University of National and World Economy, Sofia. If plagiarism is identified, the report is removed and the author is denied participation in the conference.

After the plagiarism check, all full articles go through double-blind peer review from the International Program Committee or external reviewers depending on the topic, title and subject of the article. Peer reviewers provide a critical assessment of the paper, may recommend improvements, and suggest that the paper be: accepted as submitted; to be accepted with corrections or not to be admitted for presentation at the conference and publication. The peer review recommendations are not mandatory for acceptance by the author, however it is strongly advised that the author explains any issues related to research methodology and discussion.

IDARA 2024 covered a wide range of topics related to agrarian business, business models, innovative marketing solutions, the development of rural areas in the context of the economy transforming towards sustainability, etc. The forum delved into areas such as opportunities for revitalization of rural areas, impact of local factors for changes on labor and farm number, digital solutions for the administration of land management processes, demographic processes and problems in rural areas, the workforce in agriculture, the use of agricultural lands and the applied technologies for their protection, green economy, utilization of waste, environmental protection activities, benefits of managing food loss and waste for sustainable rural development, the role of agricultural subsidies in shaping young farmers' decision-making, etc.

Participation in the conference took more than seventy researchers representing eight countries from different universities, eminent faculties, scientific institutes, colleges, associations, etc.

In the upcoming years, the conference will continue to bring together worldwide academic community leaders via scientific and applied research, providing chances for interactive debates and experience sharing.

CONTENTS

INTRODUCTION

The papers presented at the fourth consecutive International Scientific Conference, “Innovative Development of Agrarian Business and Rural Areas”, which was held on October 3 and 4, 2024, by the University of National and World Economics' Department of “Economics of Natural Resources”, are included in the conference proceedings. Numerous obstacles faced by rural communities and agrarian businesses were brought on by the COVID-19 epidemic, digitization and globalization processes, climate change, and the Common Agricultural Policy. As a result, it became necessary to find new solutions in the areas of business models, policies, the shift to a green economy, the bio-economy, the circular economy, and others. For scholars and specialists in the agricultural economy and regional development, this led to a variety of issues, debate topics, and strategic options. The scientific community was very interested in the topic of the meeting. Thirty-seven report abstracts from sixty-three authors submitted requests to attend the conference. Following two anonymous reviews and an originality check, 32 papers with 52 authors were accepted and featured in the conference program. 15,6% of the reports were rejected for a variety of reasons pertaining to the subject, the reports' scientific quality, and other factors.

The participants in the conference from Bulgaria are representatives of eight research institutions and specifically:

- ✓ three Bulgarian universities: University of National and World Economy, Sofia; D. A. Tsenov Academy of Economics Svishtov; The Agricultural University – Plovdiv;
- ✓ Higher School of Security and Economics, Plovdiv;
- ✓ four research institutes: Institute for Economic Research at the Bulgarian Academy of Sciences, Sofia; Institute of Agrarian Economics at the Agricultural Academy, Sofia; Institute of agriculture – Kyustendil, Agricultural Academy; Institute of Cryobiology and Food Technologies, Agricultural Academy, Sofia.

A significant part of the authors (45.1%) are researchers and teachers from seven countries and, more specifically, from university institutes such as:

- ✓ The University of Poloponnese, Greece;
- ✓ Bucharest University of Economic Studies, Romania;
- ✓ The Institute of Agrarian and Food Economics – the National Research Institute of Warsaw, Poland;
- ✓ University of Agriculture in Kraków, Poland;
- ✓ University of Economics and Human Sciences in Warsaw, Warsaw, Poland.
- ✓ University of the National Education Commission, Krakow, Poland.

- ✓ University of Foggia, Italy;
- ✓ Institute of Economics and Forecasting of National Academy of Sciences of Ukraine, Kyiv, Ukraine;
- ✓ Public International Business College Mitrovica (IBCM), Mitrovica Kosovo;
- ✓ Albanian School of Public Administration, Albania.

The high quality of the approved papers was achieved thanks to the established international program committee of the conference, which includes prominent researchers in the field of agrarian economics, rural development, green economy and bio economy from 14 countries in the world. The high quality of the approved papers was achieved thanks to the established international program committee of the conference, which includes prominent researchers in the field of agrarian economics, rural development and the green economy from 14 countries. Among them are authoritative scientists such as Prof. Hrabrin Bashev (Bulgaria), Assoc. Prof. Michael Sykuta (USA), Prof. Emilio Galdeano Gómez (Spain), Prof. Elena Horska (Slovakia) and others whose research has been cited more than a thousand times. In the plenary session and at the meetings sections, were presented reports in several thematic directions:

- ✓ Innovative business models for the development of agrarian business and rural areas;
- ✓ European and national policies for innovative development of agriculture and rural areas;
- ✓ Digitalization, diversification and sustainable growth in rural areas;
- ✓ Bio economy, green architecture and business;
- ✓ Innovative approaches to agricultural and rural management.

Four presentations were included in the plenary session. The issues with digitization were the main emphasis of the first one. The study's objective is to examine the potential for risk management in the agriculture industry by implementing digital initiatives at both the macro and micro levels. According to study results, digitization may enhance supply chain, logistics, and primary production while lowering food waste and losses.

Comparing the effects of European funding on Romanian and Bulgarian agriculture was the focus of the second presentation. During the previous two programming periods, the research team from Bucharest University of Economic Studies identified the similarities and contrasts between the two nations' usage of European funding. Results from the monitoring of greenhouse gas emissions from the execution of agricultural activities were provided in the third report. For the years 2018 – 2022, the amounts and rates of change in greenhouse gas emissions by certain agricultural components in Bulgaria were examined. Furthermore, a comparison study was conducted between 1990 and 2007. Agriculture both significantly contributes to and is impacted by climate change, as was shown in the fourth session. Evaluating Bulgaria's agricultural and environmental institutions' preparedness for climate change adaptation is the main objective of the study. Based on this, the findings of the examination of the institutional readiness and policies for climate change adaptation in rural Bulgaria were shown. Trends and findings from a variety of studies on agribusiness, rural regions, the circular economy, the green economy, etc. were presented in the five theme sessions.

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DIGITALIZATION AS A TOOL FOR RISK MANAGEMENT IN THE AGRICULTURAL SECTOR

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Abstract
Risk management is an integral part of the management process of any organization, including in the agricultural sector. The increasing adoption of digital technologies is becoming an essential part of the sector's activities. The aim of this publication is to analyze the opportunities for risk management in the agricultural sector through the introduction of digital activities at both macro and micro levels. Digitalization in agriculture is crucial for managing risks and reducing the negative impact of agricultural activities. It can improve primary production, supply chain, logistics performance, and reduce food losses and waste. However, digitalization may pose risks due to significant investment in digital solutions and lags behind other sectors. Traditional methods often fail to reduce risks, but digital technologies can transform communication channels, build infrastructure, and reduce errors in data entry. By implementing risk management strategies, farmers can obtain more benefits and free up resources for other sectors. At the micro level, new technologies, access to digital markets, and improved risk management are being implemented at the individual farm level, thereby contributing to the sustainable development of the agricultural sector. The publication includes the following main tasks: 1) a theoretical review of the key risks in the agricultural sector; 2) an analysis of micro and macro risks in the sector that can be managed through digital technologies; and 3) key findings and conclusions. The publication draws its information from both – theoretical sources and agricultural sector research.
Key words: agriculture, risk, digitalization, management
JEL: Q10, Q16, Q55

Introduction

Risk management in the agricultural sector is the subject of research by numerous authors, who most often categorize risks as internal and external (Jankelova, Masar, & Moricova, 2017; Georgieva, & Kirechev, 2017; D'Alessandro, Caballero, Lichte, & Simpkin 2015), random and systematic (Komarek, De Pinto, & Smith, 2020; Turvey, & Driver, 1987). In addition to systematizing and understanding the concept of risk, researchers focus on the impact on the sector or agricultural holding when a risk event occurs (Hardaker, Huirne, Anderson, & Lien, 1997; Stoyanova 2022; Kirechev, 2017). From the perspective of strategies and methods for risk management, there is a growing trend of incorporating digital technologies aimed at managing and minimizing risks in the agricultural sector.

On one hand the digitalization is a preposition for a risk management, but in on other hand the high level of digitalization is bringing a certain risk to the farms,

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according to the high investment of some of the digital solutions. Some of the authors stressed that in agriculture the digitalization is lagging behind and according to some other sectors as some of the industries is on very low level (Atanga, 2020; Romera, Sharifi, & Charters, 2024). The potential benefits of the digitalization are not fully used, which is can be monitored of the surveys made of some of the studies, where the main usage is on monitoring level. The digitalization by the farmers are mostly used to monitor the forecast of the weather and to check the level of the health of the crops or animals. These two usages are important for the risk management in the farms. According to the monitoring by digital tools can be collected historical data which is a key element for risk management assessment. The other perspective for usage of digital tools in agriculture is to prevent and protect the impact of agricultural activities on the environment (Rolandi, Brunori, Bacco, & Scotti, 2021). Including in the activities more precise usage of fertilizers and inputs brings less impact of the environment.

Šermukšnytė-Alešiūnienė & Melnikienė (2024) divide the digitalization of organizational, social, and technological aspects in several of their researches. The authors stress that the risk associated with a labor shortage in agriculture can be mitigated by digitizing certain processes and therefore avoiding the need for human intervention. If digital technologies can be applied, there will be considerable improvements in primary production, supply chain and logistics performance, as well as a decrease in food losses and waste (Bahn, Yeh, & Zurayk, 2021).

Furthermore, farmers are utilizing digitization to place their products on the market through digital marketing. Small farms that sell their goods directly to consumers frequently employ this technique. The tools used by them are connected to social networks that provide direct sales and product delivery right to the customer's door. Effective risk management is necessary for agricultural operations to produce sustainable results. Over the past 20 years, a growing number of possibilities have been investigated to decrease the negative effects on the financial outcomes of various risks, since the use of digital solutions is one way for monitoring, evaluating, and managing risks.

Methods and methodology

The aim of this publication is to analyze the opportunities for risk management in the agricultural sector through the introduction of digital activities at both macro and micro levels.

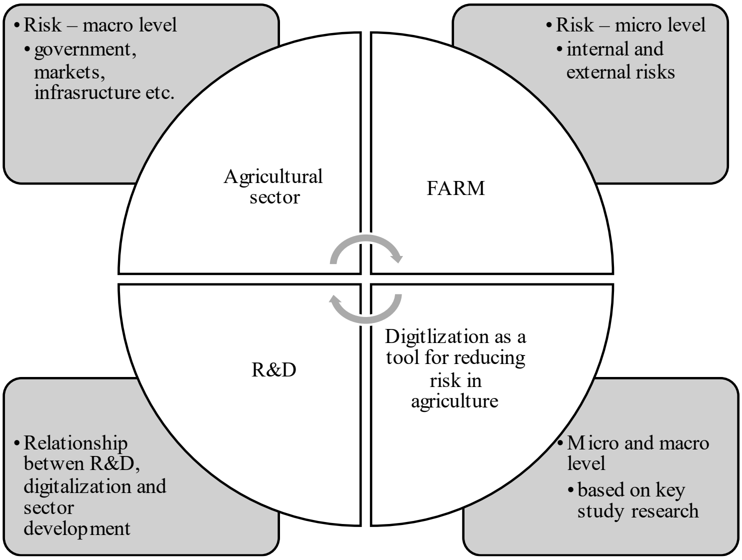

Figure 1. Methodological framework of the study

Source: own data

The publication includes the following main tasks: 1) a theoretical review of the key risks in the agricultural sector, 2) an analysis of micro and macro risks in the sector that can be managed through digital technologies, and 3) key findings and conclusions. The methodological framework is shown in the figure 1.

The results are based on theoretical research and case study of agricultural sector, which took place in 2023. It aims to revile the relationship between the level of usage of digital tools in the context of risk management. Case study includes one of the main and most important productions in agriculture- wheat, milking cows, vineyards and vegetables. The conclusions are generalized and do not pretend to be representative, but to point the focus of possible direction of development of the sector directed by the digital technologies.

Generally, the digitalization of different phases of agricultural risk management will be researched. The possible phases are presented in figure 2.

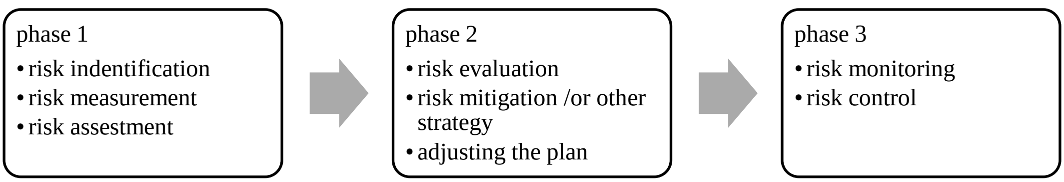

Figure 2. Main phases of risk management

Sources: adaptation by Tummala, R., & Schoenherr, T. (2011)

The publication is part of the results of project No. NID NI – 5/2024/A Economic effects of digitalization in the agricultural sector in Bulgaria, by the Scientific Research Activity fund at UNWE.

Results and discussion

Because of the unique nature of the agricultural sector, risks accompany every process (Fleisher, 1990). Traditional methods do not always achieve the desired reduction in the impact of risk events. The goal of new technologies is to make management decisions more accurate and timelier, which will benefit not only businesses but also society and the environment.

Digital technologies in the context of risk management can be classified into the following levels, which contribute to the sustainable development of the agricultural sector:

Macro level:

- By transforming traditional communication channels and document management into an electronic environment, both individual farmers and institutions benefit. Some digital services provide convenience through cadastral maps, precise surveying, and parcel delineation, among others; This level also includes building infrastructure and connections between institutions and end-users, working databases and information repositories, electronic resources, and more; Additionally, the use of electronic forms, notifications, and other tools can reduce the risk of errors in data entry.

All these services positively impact the sector's development and reduce the likelihood of risks by:

- Reducing the risk of information delays, streamlining document flow, increasing transparency in procedures, minimizing human error, and reducing the need for human involvement, freeing up resources for other sector needs, both in terms of administrative capacity and for system users – such as farmers, organizations, and others.

Agricultural sector and individual farm level (micro level)

1) New technologies,
2) Access to digital markets,
3) Production processes, storage, transport, and product realization,
4) Risk management.

Results of a case study

Farms that are mechanized and use new technologies are also more likely to adopt digitalization. Grain production is one of these sectors. The availability of capital and resources contributes to this trend, allowing these farms to adapt to the new reality. This includes the use of applications to monitor activities across the entire chain, as described in the methodology. Furthermore, while the majority of farm owners are over the age of 50, a closer look at social characteristics reveals the presence of younger household members who drive the adoption of digital solutions. The typical profile is of a young, educated household member who is not directly involved in the farming operations, often working outside the agricultural sector, but acts as a “consultant”, building a bridge to new realities.

The opposite is also true – small farms managed by elderly people, often retirees, are lagging behind and are often unable to implement any digital services.

Looking back at historical data and statistics, the sector's progress in adopting digital solutions is clear. However, it remains unclear how far the sector's capacity and willingness to adopt digital solutions can go. The data shows some progress, but not at its full potential. One important takeaway is that digitalization is moving faster than the sector's ability to fully comprehend and justify the need and feasibility of implementing these technologies.

The case study participants assessed the risk's likelihood and potential consequences, which will be used as a basis for a potential digital solution that will be covered in more detail later in this publication (table 1).

Table 1. Type of common risks in studied farms

Risk	Possibility to occur	Consequences if the risk occurrence
Product risk (several categories)	85%	45%
Climate risk	100%	85%
Labor risk	85%	60%
Other risk	60%	40%

Source: own data

The risks shown in the table 1 are the most frequent ones that arise in the farms under the study. In relation to digitization, farmers stated that digital tools for monitoring are essential for preventing dangers and taking appropriate action to implement on the farm. The largest farms mentioned that some of the procedures may be automated, which lowers the possibility of a labor shortage and also lowers the amount of inputs utilized since they are employed more precisely and at a lower cost.

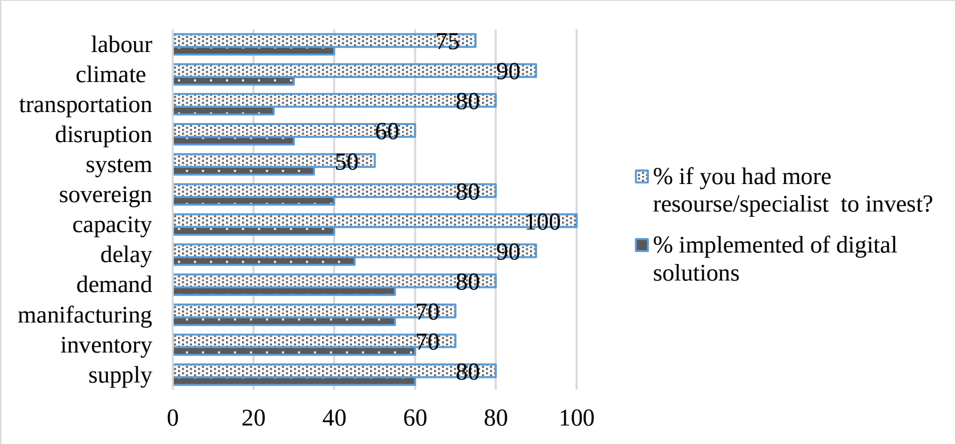

Figure 3. Implementation of digital solutions related to risk management and a willingness to adopt more digital solutions,

Source: own finding

Most common digital solutions applied in by the farms, which are pointed a s possible tool for risk reduction is related to environment conditions, trading, precise agriculture, production processed, digital implementation of inputs, autonomy of agriculture practices, monitoring of the health of the crops/animals and etc. Figure 3 presents the gathered information of actual status of implemented digital solutions and a possibility of increasing the level of digitalization related to investments and specialists in the field of digital solutions.

Digitalization and Research & Development in Support of the Agricultural Sector

An increasing number of scientists are conducting research on novel crop varieties and the adaptability of plant and animal breeds using digital solutions. Digital twins are one technique being used, which shows a crop's resilience and performance under various climatic conditions in a shorter amount of time. Choosing the right variety to produce minimal deviations from expected results and reduce the risk of yield loss is the main component of risk management. Scientists are also studying the impact of digital solutions aimed at environmental protection, proving their effects and minimizing the risks associated with agricultural activities (Harizanova-Bartos, Stoyanova, Petkova, Metodiev, Harizanova-Metodieva, Sheiytanov, & Dimitrova, 2021; Branzova, 2022). Often, this involves technologies that detect the need for specific agro-technical actions, ensuring they are timely and applied only in areas that require them. One of the many effects of this approach is detecting diseases in certain fields, allowing for precise application of treatments only in affected zones, thus reducing the negative impact of chemicals. In livestock farming, digital solutions also act as a springboard for reducing the risk of human error related to disease detection in animals, enabling the necessary protocols to be activated to limit the spread of infections.

Main findings and conclusions

The implementation of digital solution in agriculture as took for reducing risk would require a much higher degree of coordination than is currently observed in agricultural sector, and possibly the need for central coordination entities. Risk management in the agricultural sector is a complicated and multifaceted issue that includes both internal and external risks. The high level of digitalization in agriculture may pose risks due to the significant investment in digital solutions, digitalization lags behind other sectors, with some industries performing poorly. The primary application of digital tools in agriculture is to monitor weather forecasts and crop health, which are critical for risk management. Digitalization can also help to mitigate and protect the environmental impact of agricultural activities. Digitalization can also help prevent and protect the environmental impact of agricultural activities. Digitalization can also improve primary production, supply chain, logistics performance, and reduce food losses and waste. Farmers are also using digital marketing to place their products on the market, promoting sustainable results.

The agricultural sector faces risk due to its specific activities. Traditional methods often fail to reduce these risks. Digital technologies can help manage these risks by transforming communication channels, building infrastructure, and reducing errors in data entry. These services reduce information delays, streamline document flow, increase transparency, minimize human error, and free up resources for other sectors. At the individual farm level, new technologies, access to digital markets, and improved risk management can further enhance the agricultural sector's development.

As a conclusion can be summarized that digitalization is key factor for successful risk management and the farmers can obtain more benefits by implementing risk management strategies to reduce the negative impact of the produce, but still the usage is not in full scale.

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IMPACT OF THE COMMON AGRICULTURAL POLICY FUNDS ON THE DEVELOPMENT OF THE AGRICULTURAL SECTOR, CASE STUDY ROMANIA – BULGARIA

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Abstract
Romania and Bulgaria are the only European Union member countries for which there was only one treaty upon accession. Thus, joining at the same time, we can consider that the starting point was common, since 2007 projects from European structural and investment funds have been attracted and implemented. The present research aims to identify the implications that European funds granted under the Common Agricultural Policy have had on the two agricultural sectors in the Romania-Bulgaria comparative analysis. For this purpose, data from European and international databases on European structural and investment funds attracted will be used, as well as result indicators that will measure the performance and competitiveness of the agricultural sectors.
Keywords: Common Agricultural Policy (CAP), Impact, Romania, Bulgaria, Subsidies, Rural Development
JEL: Q18, Q14

Introduction

The Common Agricultural Policy (CAP) is an important framework that has had a significant impact on the agricultural sector in the European Union (EU), including Romania and Bulgaria. (Shahbaz et al., 2011) The main instruments of the CAP, the European Agricultural Guarantee Fund (EAGF) and the European Agricultural and Rural Development Fund (EAFRD), play a crucial role in shaping the development of the agricultural industry in both countries (Beltrán & Gosálvez, 2022), (Tarditi, 1987).
The CAP has had a range of positive and negative effects on resource allocation, income distribution, and environmental outcomes. While the policy has supported the growth of agricultural production, it has also been criticized for its uneven distribution of support, often favoring larger producers over small and medium-sized farmers. The structural policies of the CAP also fail to address the unique regional

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challenges faced by Mediterranean countries such as Italy, whose agricultural landscapes share similarities with Romania and Bulgaria (Bedington, 2011).
Recent developments in the CAP, such as a greater focus on environmental sustainability and support for precision farming technologies, have the potential to address some of these imbalances (Balafoutis et al., 2017). However, national policies and public investments in areas such as agricultural research and extension services are also crucial to ensure a balanced development of the agricultural sectors in these countries.
Combining the CAP with other EU financing instruments, such as those related to the bioeconomy and circular economy, could also create new opportunities for farmers to diversify their businesses and reduce risks. Overall, the impact of the Common Agricultural Policy on agricultural development in Romania and Bulgaria is a complex and multifaceted issue that requires a nuanced understanding of the interaction of the policy with national and regional factors.
The aim of this study is to determine the impact of European funds awarded under the Common Agricultural Policy on the agricultural sectors of Romania and Bulgaria through a comparative analysis of these two countries.

Literature review

The Common Agricultural Policy (CAP) is one of the most significant instruments of the European Union, aimed at supporting rural development, ensuring a decent income for farmers and stabilizing agricultural markets. In the context of the eastward enlargement of the European Union, Romania and Bulgaria have become beneficiaries of CAP funds, which has brought notable changes in the agricultural sector of both countries (Puzić et al., 2014).

Economic Development

In Romania and Bulgaria, CAP funds have had a significant impact on the modernization of agriculture. Access to direct payments and rural development programs has allowed farmers to invest in modern technologies, improve agricultural infrastructure and increase competitiveness. According to a report by the European Commission (2020), approximately €7.5 billion was allocated to Romania and €2.9 billion to Bulgaria through the CAP in the period 2014 – 2020 (Inforegio – €8.2 billion for jobs and improved quality of life in all regions of Romania, 2015).
However, the economic impact was not uniform. In Romania, CAP funds mainly favored large farms, while small and subsistence farms benefited less. This led to economic polarization in the agricultural sector. In Bulgaria, investments were targeted more equitably, but problems of corruption and bureaucratization limited the efficient use of funds (Mocanu et al., 2020).

Social Impact

CAP funds have also contributed to improving the quality of life in rural areas by creating jobs and developing local infrastructure. Rural development programs have funded projects to upgrade roads, access to basic services and promote rural tourism (Manea et al., 2013).

In Romania, however, rural-urban migration and emigration continued to be major challenges. Young people have been reluctant to stay in the agricultural sector, despite available funding, due to limited career development prospects and low incomes. In Bulgaria, CAP initiatives have been more successful in stimulating youth employment in agriculture due to dedicated support programs (Aleksiev, 2020).

Environmental Sustainability

Another important aspect of the CAP is the promotion of sustainable agriculture. CAP funds have supported the implementation of organic farming practices such as crop rotation, conservation agriculture and the use of renewable resources. In both countries, funds for agri-environment and climate measures have been key to reducing the negative environmental impacts of agriculture.

In Romania, however, the uptake of these measures has been uneven, with better implementation in more developed regions. In Bulgaria, environmental programs have been implemented more systematically, but have encountered difficulties due to lack of knowledge and farmers' resistance to change (Džakula et al., 2022).

Materials and methods

In order to determine the purpose of the paper, data from the Eurostat database on the funds attracted through the two pillars of the Common Agricultural Policy, namely the European Commission's financial reports, as well as data on the value of agricultural production (divided by sectors) and gross value added were used.

These data were analyzed quantitatively, in terms of dynamics, and subsequently covariance analysis was determined in order to identify the links between variables and correlation coefficients to determine the intensity of these links.

Results and discussions

The aim of this paper was to determine the implications that the value of the European Structural and Investment Funds of the Common Agricultural Policy may have on the development of the agricultural sector in the Romania – Bulgaria parallel analysis. Thus, in the first part of the research, the values attracted by the two countries under the two pillars of the CAP, namely market measures through direct support and rural development, were analyzed.

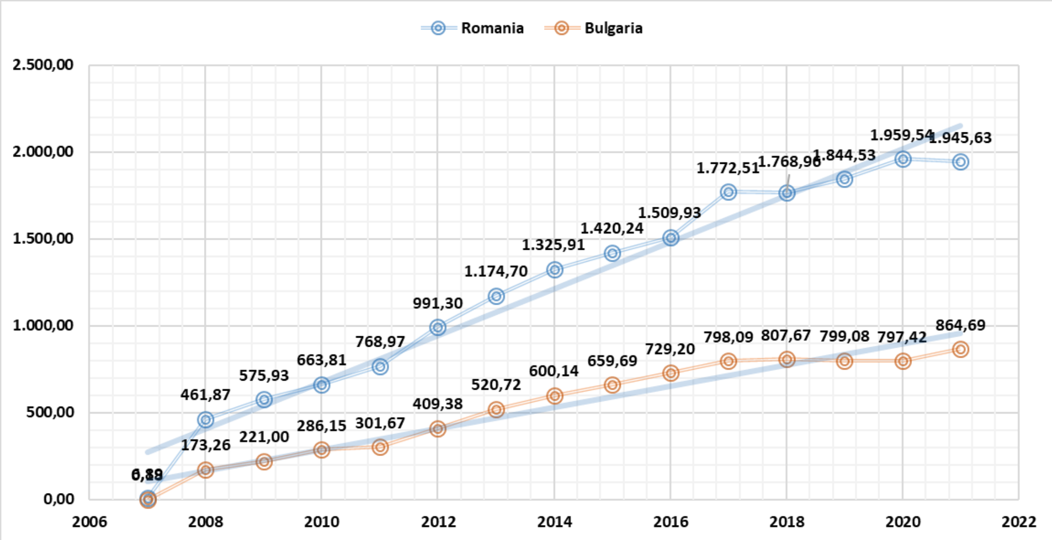


Figure 1. Dynamics of funds attracted through EAGF, Romania – Bulgaria, million euro

Source: data processing available from General Directorate for Agriculture and Rural Development, FINANCIAL REPORT

Analyzing the support received by Romania since its accession to the EU, until 2021, it can be seen that the direct support for market measures has increased significantly, from €6.9 million in 2007 to approximately €2 billion in recent years, with the maximum being reached in 2020 when the support through the European Agricultural Guarantee Fund (EAGF) was €1.96 billion.

As for the support for Bulgaria from the EAGF, in the year of accession it amounted to €180 thousand, subsequently increasing to the last year's peak of €864.7 million.

By analyzing the statistical indicators for the two countries, it can be determined that on average, Romania has registered funds of EUR 1.2 billion annually, compared to Bulgaria, which has registered on average EUR 531.2 million annually. To a large extent, this difference is also explained by the number of applications submitted and the total agricultural area of beneficiaries, the agricultural area in Bulgaria being smaller.

Calculating the deviation from this average, Romania had an average annual deviation of €611 million and Bulgaria a deviation of €279 million, leading to high coefficients of variation, given the rather high year-on-year increase, with coefficients of variation of 50% (Romania) and 52% (Bulgaria).

On average, even though the amount of funds in Romania was higher, the average annual growth rate was faster for Bulgaria, with higher year-on-year growth compared to Romania.

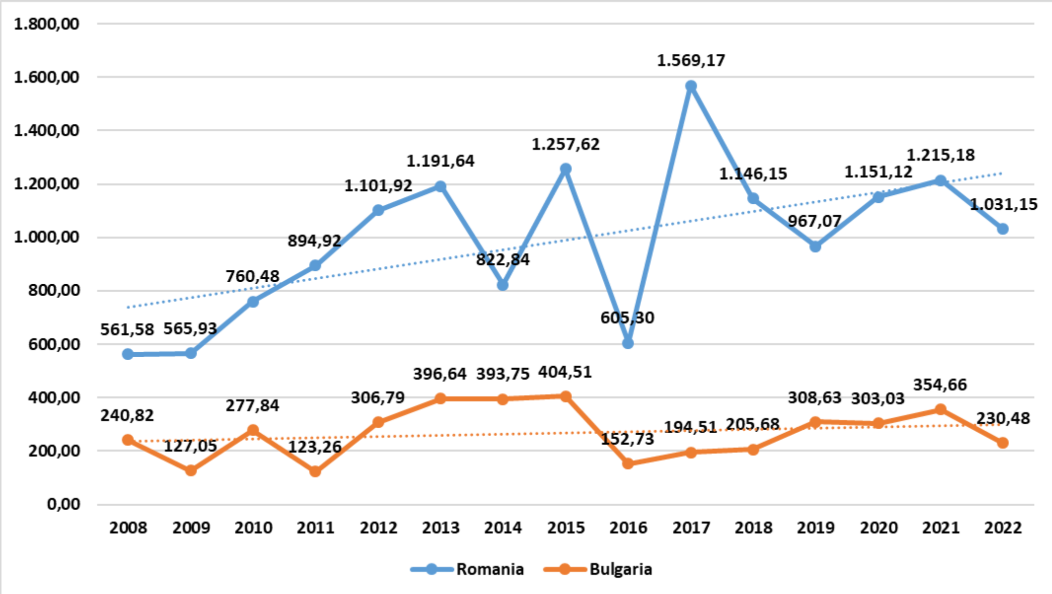


Figure 2. Dynamics of funds attracted through EAFRD, Romania – Bulgaria, million euro
Source: data processing available from European Commission, FINANCIAL REPORT

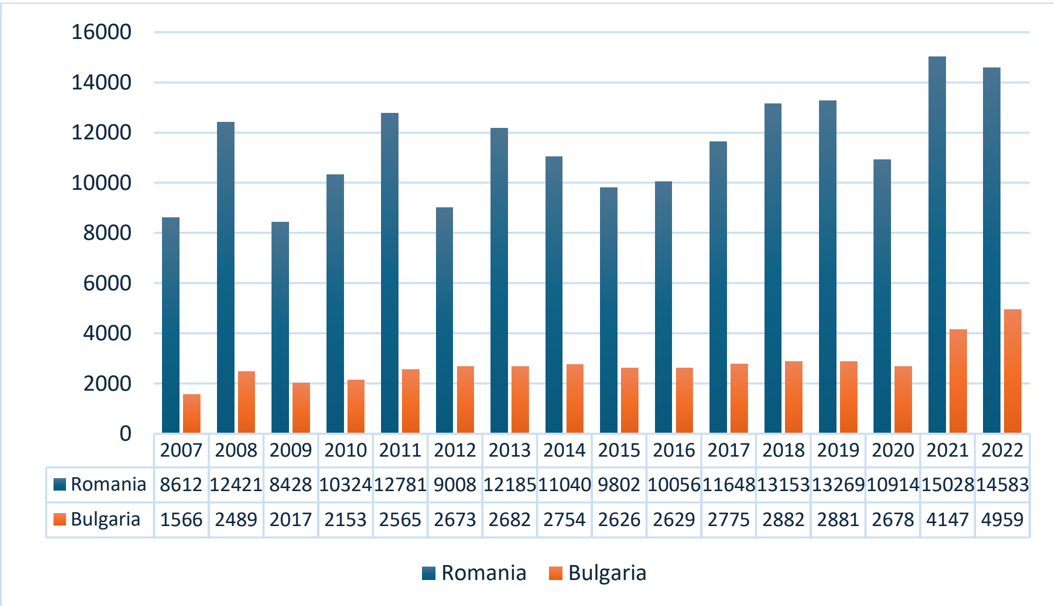
With regard to the funds attracted through the second pillar of the PAC, namely those related to rural development, it can be observed that Romania registers oscillating funds, depending on the project sessions and calls for funding measures, in 2008 being the first in which. payments were made, totaling 561 million euros, increasing to a maximum of 1.57 billion euros in 2017, and in 2022 they were just over 1 billion euros.

Regarding the funds for rural development registered by Bulgaria through the EAFRD, it can be seen that the projects in 2008 were 240 million euros, this increased to the value of 404 million euros in 2014, and this later returned to the value of 230 million euros in 2022.

These oscillations, recorded both in Romania and in Bulgaria, are given by the management of project calls related to rural development measures, as well as their access to beneficiaries.

Analyzing the statistical indicators for the two countries, the following can be determined, on average, annually Romania registered funds of 989.5 million euros, compared to Bulgaria, the latter registering on average 268 million euros annually. Calculating the deviation from this average, Romania recorded an annual deviation of 288 million euros, and Bulgaria recorded a deviation of 95 million euros, these values leading to moderate coefficients of variation, these being 29.1% (Romania) and 35.7% (Bulgaria).

Analyzing the annual rate of change, a slight increase is registered for Romania, on average the value of funds for rural development was higher from year to year by 4.4%, on the other hand in Bulgaria the average annual rate was negative or we can say that almost constant, value being –0.3%.
Next, result indicators regarding progress in the agricultural sector will be analyzed. For this were the databases related to the economic accounts in agriculture, the extraction of the data related to the value of crop production, the value of animal production, the value of the entire agricultural production, as well as the gross value added in agriculture.

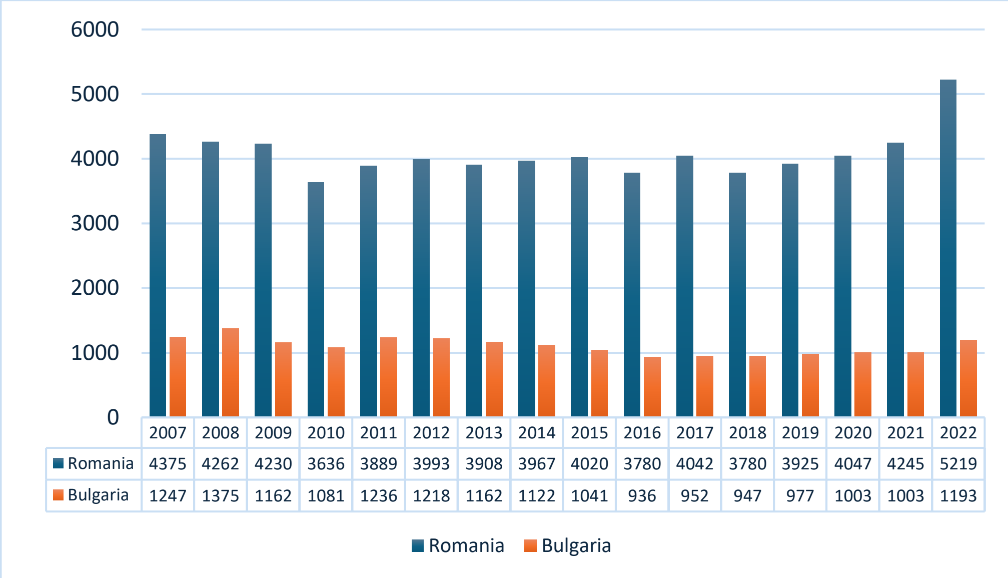


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Romania	8612	12421	8428	10324	12781	9008	12185	11040	9802	10056	11648	13153	13269	10914	15028	14583
Bulgaria	1566	2489	2017	2153	2565	2673	2682	2754	2626	2629	2775	2882	2881	2678	4147	4959

Figure 3. Value of crop production, million euros

Source: Eurostat data processing

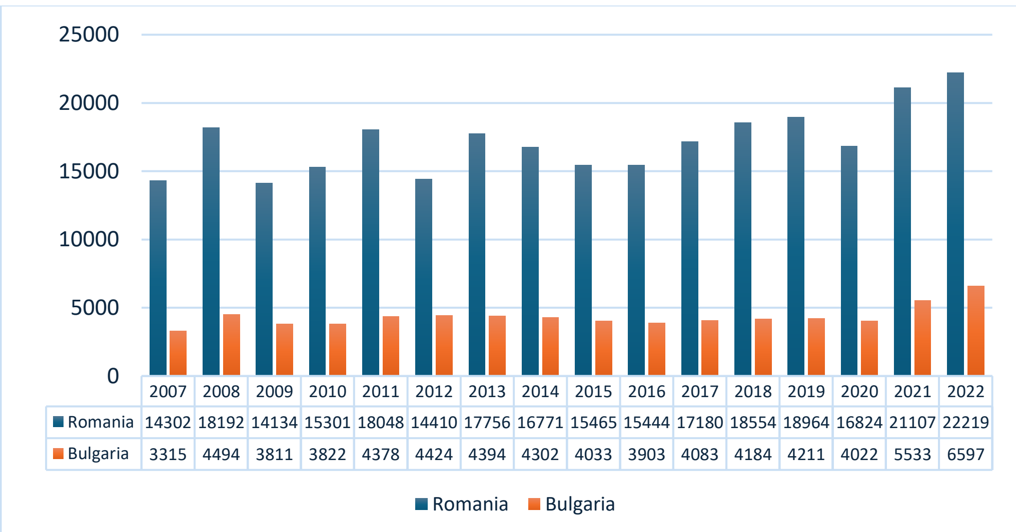
The graph illustrates the value of vegetable production in millions of euros for Romania and Bulgaria over a period of 16 years. The data show that Romania had a significantly higher vegetable production compared to Bulgaria. After a notable decrease in 2009, Romania registered a general upward trend, with a peak in 2021 at 15,028.32 million euros. In contrast, Bulgaria saw steady and moderate growth, peaking at €4,959.47 million in 2022.



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Romania	4375	4262	4230	3636	3889	3993	3908	3967	4020	3780	4042	3780	3925	4047	4245	5219
Bulgaria	1247	1375	1162	1081	1236	1218	1162	1122	1041	936	952	947	977	1003	1003	1193

Figure 4. Value of livestock production, million euros
Source: Eurostat data processing

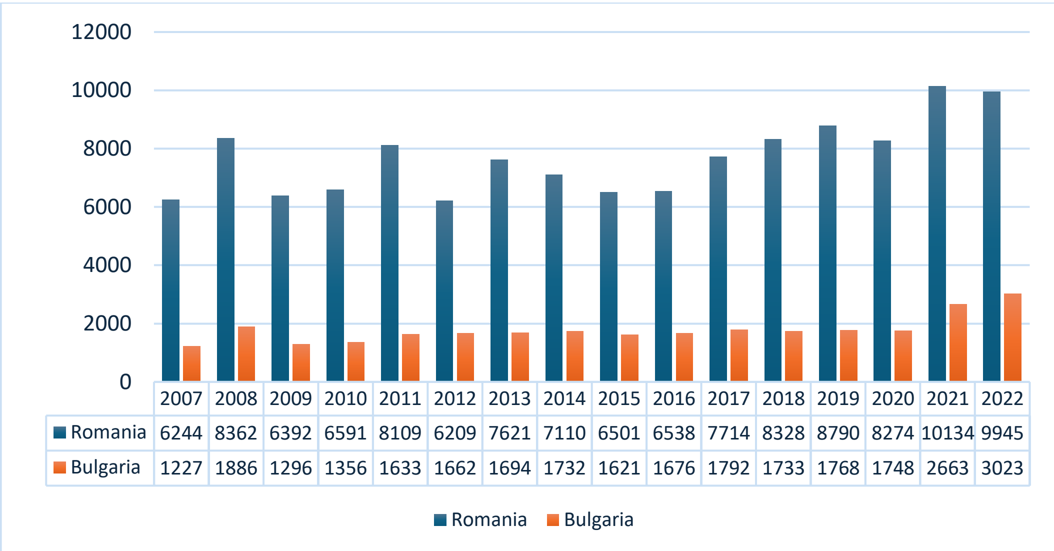
Figure 4 shows the value of livestock production in millions of euros for the same countries and period. Romania and Bulgaria had closer values compared to vegetable production. Romania maintained relatively stable values, with a slight increase in 2021 and 2022. Bulgaria had lower livestock production, with a decline around 2016, but gradually recovered by 2022.



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Romania	14302	18192	14134	15301	18048	14410	17756	16771	15465	15444	17180	18554	18964	16824	21107	22219
Bulgaria	3315	4494	3811	3822	4378	4424	4394	4302	4033	3903	4083	4184	4211	4022	5533	6597

Figure 5. The value of the production of the agricultural branch, millions of euros
Source: Eurostat data processing

Figure 5 illustrates the total value of agricultural production, combining both plant and animal production. The data shows that Romania has consistently dominated, with values increasing from approximately €14,301.54 million in 2008 to €22,218.82 million in 2022. Bulgaria had a similar but more modest increase, reaching a maximum of €6,596.76 million in 2022.



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Romania	6244	8362	6392	6591	8109	6209	7621	7110	6501	6538	7714	8328	8790	8274	10134	9945
Bulgaria	1227	1886	1296	1356	1633	1662	1694	1732	1621	1676	1792	1733	1768	1748	2663	3023

Figure 6. Gross added value, million euros

Source: Eurostat data processing

The final graph shows the gross value added of the agricultural sector. In Romania, gross value added varied but followed a general upward trend, with a peak in 2021 at 10,133.81 million euros. Bulgaria followed a similar trend with slow and steady growth, peaking in 2022 at €3,023.42 million.

Romania outperformed Bulgaria in all categories, reflecting a more developed and robust agricultural economy. However, there are notable fluctuations in both countries, indicating the influence of external factors such as weather conditions, agricultural policies and international markets. Overall growth in recent years suggests an improvement in the agricultural sector in both countries, but with significant differences in the magnitude of this growth.

Table 1. Analysis of the covariation between the amounts allocated to agriculture through EAFG and EAFRD and the value of agricultural production, Romania and Bulgaria

Romania	*EAFG – RO*	*EAFRD – RO*	*Crop output – RO*	*Animal output – RO*	*Output of the agricultural 'industry' – RO*	*Gross value added at basic prices – RO*
EAFG – RO	348869					
EAFRD – RO	95422	77636				
Crop output – RO	585652	148303	3853592			
Animal output – RO	–35758	4408	197689	122628		
Output of the agricultural 'industry' – RO	631562	166657	4365274	379733	5187459	
Gross value added at basic prices – RO	363272	89568	2277073	195327	2696818	1493571

(a)

Bulgaria	*EAFG – BG*	*EAFRD – BG*	*Crop output – BG*	*Animal output – BG*	*Output of the agricultural 'industry' – BG*	*Gross value added at basic prices – BG*
EAFG – BG	73066					
EAFRD – BG	6600	8568				
Crop output – BG	108916	9848	581097			
Animal output – BG	–29891	–647	–15907	16011		
Output of the agricultural 'industry' – BG	53247	6970	535850	11254	540334	
Gross value added at basic prices – BG	52503	5431	330278	–2954	313163	196398

(b)

Source: own data processing

Tables 1a and 1b highlight the covariance coefficients between funds destined for agriculture and production values for Romania and Bulgaria. In the case of Romania, we observe that there is a strong positive covariance between the EAFG – RO and EAFRD – RO funds, which indicates a close relationship between these funds. Also, there is a moderate covariance between EAFG – RO funds and crop production (Crop output – RO), as well as a high covariance between EAFG – RO funds and the output of the agricultural industry, which underlines the importance of these funds in supporting agricultural production. The moderate positive covariance between EAFG – RO and gross value added at basic prices suggests that these funds contribute significantly to the economic value added of the agricultural sector.

As for the EAFRD – RO funds, they show a strong positive covariance with both crop production and agricultural industry output, indicating a significant impact on these segments of agriculture. Crop production exhibits a very high covariance with agricultural industry output, suggesting that an increase in crop production is closely related to an increase in total agricultural industry output. There is also a high positive covariance between crop production and gross value added at basic prices, highlighting the importance of crop production in the agricultural economy.

In the case of Bulgaria, the EAFG – BG and EAFRD – BG funds show a strong positive covariance, similar to the situation in Romania, suggesting a concerted use of these funds to support agriculture. The moderate covariance between EAFG – BG funds and crop production, as well as the high covariance between EAFG – BG funds and agricultural industry output, indicate the essential role of these funds in stimulating agricultural production. The moderate positive covariance between EAFG – BG funds and gross value added at basic prices also suggests an important contribution to the economic value of agriculture.

The strong positive covariances between EAFRD – BG funds and crop production, respectively the output of the agricultural industry, underline the importance of these funds for the agricultural sector. Crop production in Bulgaria shows a very high covariance with agricultural industry output, similar to Romania, indicating that crop production is a main driver of total agricultural production.

Overall, the tables show that European agricultural funds have a significant and positive impact on agricultural production and economic value added in both countries, although there are some complex dynamics, such as negative covariances with livestock production, that require further analysis to be fully understood.

Table 2. Analysis of the correlation coefficients between the amounts allocated to agriculture through EAFG and EAFRD and the value of agricultural production, Romania and Bulgaria

Romania	*EAFG – RO*	*EAFRD – RO*	*Crop output – RO*	*Animal output – RO*	*Output of the agricultural 'industry' – RO*	*Gross value added at basic prices – RO*
EAFG-RO	1.0000					
EAFRD-RO	0.6463*	1.0000				
Crop output-RO	0.5366*	0.2830	1.0000			
Animal output-RO	–0.3071	0.0448	0.2876	1.0000		
Output of the agricultural 'industry'-RO	0.5545*	0.2689	0.9763**	0.4761	1.0000	
Gross value added at basic prices-RO	0.5550*	0.2673	0.9491**	0.4564	0.9689*	1.0000

(a)

Bulgaria	*EAFG – BG*	*EAFRD – BG*	*Crop output – BG*	*Animal output – BG*	*Output of the agricultural 'industry' – BG*	*Gross value added at basic prices – BG*
EAFG-BG	1.0000					
EAFRD-BG	0.2910	1.0000				
Crop output-BG	**0.7588***	0.1482	1.0000			
Animal output-BG	**–0.8607****	–0.0559	–0.1649	1.0000		
Output of the agricultural 'industry'-BG	0.4244	0.1064	0.9563**	0.1210	1.0000	
Gross value added at basic prices-BG	**0.6146***	0.1355	0.9777**	–0.0527	0.9613**	1.0000

(b)

*Source: own data processing, **. Correlation is significant at the 0.01 level (2-tailed).*

The tables present the correlation coefficients between the funds intended for agriculture and the production values for Romania and Bulgaria. In the case of Romania, the moderate positive correlation between EAFG – RO and EAFRD – RO (0.6463) suggests a close relationship between these funds. There is a moderate correlation between EAFG – RO and crop output (0.5366), indicating that these funds contribute significantly to crop production. Conversely, the negative correlation between EAFG – RO and animal output (–0.3071) suggests that an increase in EAFG – RO funds could be associated with a decrease in animal production.

For EAFRD – RO, the relationships are weaker, having small correlations with crop output (0.2830) and animal output (0.0448). However, there are moderate correlations with agricultural industry output (0.2689) and gross value added at basic prices (0.2673). Crop production shows a very strong correlation with agricultural industry output (0.9763) and gross value added (0.9491), underlining its major importance in the agricultural economy.

In Bulgaria, EAFG – BG has a weak correlation with EAFRD – BG (0.2910) but a moderately strong correlation with crop output (0.7588), indicating a significant contribution to crop production. The strong negative correlation between EAFG – BG and animal output (–0.8607) suggests that funds for vegetable agriculture could have a negative impact on animal production. EAFRD – BG shows very weak correlations with crop output and animal output, but a minor contribution to the agricultural economy.

Crop production in Bulgaria has a very strong correlation with agricultural industry output (0.9563) and gross value added at basic prices (0.9777), underscoring the central role of crop production in the agricultural economy. Overall, EU funds for agriculture have a significant and positive impact on agricultural production and economic value added in both countries, although there are some complex dynamics, such as negative correlations with livestock production, that require further analysis.

In both countries, European agricultural funds have a significant impact on agricultural production, especially crop production and economic value added. However, there are complex dynamics, such as negative correlations with animal production, that may require further analysis to be fully understood. The strong correlations between crop output and agricultural industry output and gross value-added underscore the central role of crop production in the agricultural economy.

Conclusions

Analyzing the dynamics of funds attracted in relation to market interventions, it can be seen that they fluctuated quite a lot, in the analyzed period, for both states, the coefficients of variation being over 50%. This can also be seen from the fairly consistent growth of these funds. On average, even if the value of the funds in Romania was higher, the average annual growth rate was more alert for Bulgaria, which recorded higher values from year to year compared to Romania.

With regard to the funds attracted for rural development, they did not grow at the same rate as the funds for market interventions, and oscillations were also recorded. These oscillations, recorded both in Romania and in Bulgaria, are given by the management of project calls related to rural development measures, as well as their access by the beneficiaries.

Regarding the analysis of the value of agricultural production, there are explainable differences between the two countries, considering the difference in the areas and implicitly the total productions between these countries, but analyzing at an equivalent unit of measure, the value of agricultural production is very similar between the two states.

Analyzing the correlation coefficients for Romania, it can be found that there is an extremely high coefficient between the value of the agricultural industry and the value of crop production, which determines the fact that the value of the production obtained from the large crop contributes significantly to the value of the production of the agricultural branch. At the same time, average coefficients are observed in terms of intensity between the value of the funds attracted through the first pillar of the CAP and the value of agricultural production, both of entire branches and the gross added value, considering the fact that subsidies are a direct influence on income from surface exploitation. Even if it is a low-intensity relationship, it should be noted that the relationship between the funds intended for market measures are inversely proportional to the value of livestock production, thus these measures do not contribute to this sector, or even make it difficult.

A similar situation is recorded in Bulgaria, but the intensity of the links is even stronger, there is a closer relationship between the value of subsidies and the value of total agricultural production, which, as in the case of Romania, is based on large crops. And in this case, a negative relationship is observed between the amount of support through the first pillar of the CAP and the amount of livestock production.

Regarding the limits of the research, it can be appreciated that the data used were made at the national and total level, the comparisons being less highlighted, units of measurement related to a surface unit or an animal unit can be considered, but these units of measurement it would not have allowed as well to determine the correlation coefficients with the amount of support within the two pillars of the CAP.

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REGIONAL DIFFERENCES OF GREENHOUSE GASES FROM AGRICULTURAL ACTIVITIES IN BULGARIA

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Abstract
The leading role in the implementation of environmental protection and climate change policies belongs to the European Union. In this regard, the European Green Pact includes measures aimed at reducing greenhouse gas emissions by 2030 and carbon emissions by 2050. Establishing trends and the intensity of ongoing processes are of particular importance in revealing differences in the development of regions, as well as the need to take adequate measures to reduce and limit them. In this sense, in the article, monitoring of greenhouse gas emissions from the implementation of agricultural activity was carried out. An analysis of the levels and rates of change in greenhouse gas emissions by individual components of Bulgaria's agriculture was carried out for the period 2018 – 2022. In addition, a comparative analysis was made compared to 1990 and compared to 2007. The positioning of the individual regions in Bulgaria regarding the reduction or increase in emissions. The main goal of the study is to analyze the main indicators – carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) for the statistical regions in Bulgaria (North – West, North – Central, North – East, South – East, South – West and South – Central planning regions), regarding the current picture of the state and trends in the levels of greenhouse gas emissions from the activity of economic units in the agrarian sector. The analysis of the dynamics regarding the levels of CO_2, CH_4 and N_2O shows that for all six studied regions a significant decrease in values in 2007 compared to the base year 1990 is characteristic. The percentage decrease is greatest for the North-Central and North-East region (–83.48), followed by the North – West (–57.95). The reduction of methane emissions is more than 60% in different regions, and for N_2O it is in the range of –58.99 to –62.03. For the period 2018 – 2022, an increasing trend of the CO_2 and N_2O indicator is established compared to both the base year 1990 and 2007 in all studied statistical regions. For the same 5-year period, different trends are observed in the methane emissions in the individual studied areas. For three of them NWPR, SEPR and the SCPR, a sustainable reduction in emissions is observed. Despite the decrease in emissions in 2007, for the rest of the 5-year period, an increase is reported for the NCPR and NEPR, especially for the last 3 years. The South – West region is characterized by a decrease that continues until 2019, and for the remaining 3 years emissions increase again.
Keywords: agriculture, greenhouse gas emissions, planning areas, analysis
JEL code: O18, Q54, Q01

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Introduction

As an important share of the Bulgarian economy, agriculture is a highly vulnerable sector under the influence of climate change, especially in the cultivation of cereals, technical crops, fruits and vegetables. At the same time, innovative farmers are the ones who must constantly adapt to the constantly developing market, institutional and natural environment, in order to increase their agrarian sustainability. At the same time, the risk of the impact of climate change is not evenly distributed territorially. Individual regions differ in the likelihood of negative consequences, and the presence of inequalities within and between these regions is a signal of placing the emphasis both on the state regional policy and on rural development programs, on overcoming of fluctuations as a significant problem and a negative factor impact on regional development (Kotsev, 2021).

Agriculture is not only a strategic and priority sector for the development of the Bulgarian economy, but it is even much more than what is meant in the economic sense. This sector is essential for human society and plays an important role in the transition to sustainability. Agricultural activity has a direct and indirect impact on the protection and preservation of the environment, the purity of food and rural communities. It is for this reason that we should not consider agriculture solely as an economic sector, but as a sector with multifaceted benefits.

The rethinking of traditional agricultural practices, through agroecology, changing dietary habits, etc., can offer effective solutions and multiple benefits. For example, agro-ecological practices, sustainable production models, integrated production, regenerative agriculture, etc. they can certainly increase the resilience not only of individual economic units, but also of sensitive rural areas (Kirechev, 2017), (EU, 2020), (Nikolova M., 2013), (Nikolova M., 2022) etc. At the same time, this can reduce pressure on the environment and contribute to reducing greenhouse gas emissions (Billen, et al., 2021). After Bulgaria's EU membership (2007), the focus gradually shifted from agricultural productivity to a greater emphasis on environmental issues, through regulations and economic incentives.

The National Climate Change Adaptation Strategy and Action Plan of the Republic of Bulgaria defines the framework for climate change adaptation (CCA) actions and priority directions until 2030, identifying and confirming the need for CCA actions for the entire economy, as well as at the sector level incl. the agricultural sector (Dale, Zhekova, Ambrosi, Milova, & Bakx, 2018). Climate change mitigation and adaptation policy is linked to the two main strategies – mitigation and adaptation. The mitigation strategy (Ministry of environment and water, 2020) emphasizes the reduction of the anthropogenic impact on the amount of greenhouse gases or their removal from the atmosphere. Adaptation strategy is related to adaptation to current or expected climate changes and their consequences (Ministry of environment and water, 2018). Due to the need for timely measures and working solutions for each country, the issue of achieving a harmonious and balanced balance between economic progress and environmental protection becomes a priority. Agrarian business, as part of transformations in the economic environment, is also responsible to a significant extent for minimizing or removing greenhouse gases from the atmosphere. In the long-term climate change mitigation strategy until 2050 of the Republic of Bulgaria, the following two main goals have been identified:

- ❖ OBJECTIVE 1: reduction and/or optimization of emissions in the agricultural sector;
- ❖ OBJECTIVE 2: increase the awareness of both farmers and administration about the impact of their actions on climate change. The priorities for achieving the described goals are in the following areas:
  - ✓ reducing emissions from agricultural land;
  - ✓ reducing methane emissions from organic fermentation in animal husbandry;
  - ✓ improving manure management;
  - ✓ optimizing the use of plant residues in agriculture;
  - ✓ improving rice field management and rice production technologies;
  - ✓ improving farmers' and administration's knowledge about reducing emissions from the agricultural sector.

Due to the topicality of the problems in recent years, a number of authors have worked on issues related to the state and trends of greenhouse gases from agriculture. In most of the scientific publications, the issue is considered complex, i.e. Agriculture and animal husbandry are jointly analyzed as sources of greenhouse gases (Nenova, 2017). The complex approach is necessary due to the presence of various problems (Nenova, 2015): obtaining results from the application of environmentally friendly practices in plant breeding, corresponding to the reduction of global warming, requires a long period of time, in animal breeding there are processes that emit greenhouse gases that are not part of from the official statistics for the sub-sector, etc. The same author suggests that certain limits should be introduced during the monitoring in which the emissions from the respective sources can vary (e.g. from a unit of area or one head of animal), so that deviations can be observed (Nenova, 2015).
In this publication, we pay attention to the generated greenhouse gas emissions from the activity of agricultural units at the NUTS2 level – by planning regions.
The aim of the present study is a comparative analysis of the state and trends of greenhouse gas emissions related to agricultural activity at the level of statistical regions.

Methodology

The object of research is **greenhouse gas emissions**, expressed in kton CO_2eq, using the values of the global warming potential (GWP-100) from IPCC AR5 (Intergovernmental Panel on Climate Change (IPCC) Assessment Report 5). Values for major gas components – Fossil CO_2, CH_4 and N_2O from the Long-Term Emissions Database for Global Atmospheric Research – (EDGAR, 2023) (Crippa, Guizzardi, Pagani, & Pisoni, 2023). Data have been selected from the agricultural sector (in another author's publication, other economic sectors are also considered) for the statistical regions in Bulgaria. The analysis of the data is carried out by comparing the changes in the values with a reference year – 1990 (available database) and 2007 (Bulgaria – member of the EU), as well as the period 2018 – 2022 (for 2022 is the last statistical information available).

The tasks set by the authors are:

- Tracking the dynamics and structure of atmospheric air pollutant emissions by species, by applying methods of dynamic series analysis and analysis and assessment of structural changes;
- Analyzing the structural changes of greenhouse gas emissions with ranking by species and by planning areas.

For the purpose of the analysis, official statistics were used of European Union 2023, European Commission, Joint Research Center (JRC), EDGAR (Emissions Database for Global Atmospheric Research) Community Greenhouse Gas Database including IEA-EDGAR CO_2, EDGAR CH_4, EDGAR N_2O (2023).

Results

The 2021 Special Audit Report (European Court of Auditors, 2021) on the Common Agricultural Policy (CAP) and climate noted that half of the EU's climate action funds are spent through the CAP, but emissions from agriculture are not falling. The same report presents three main recommendations:

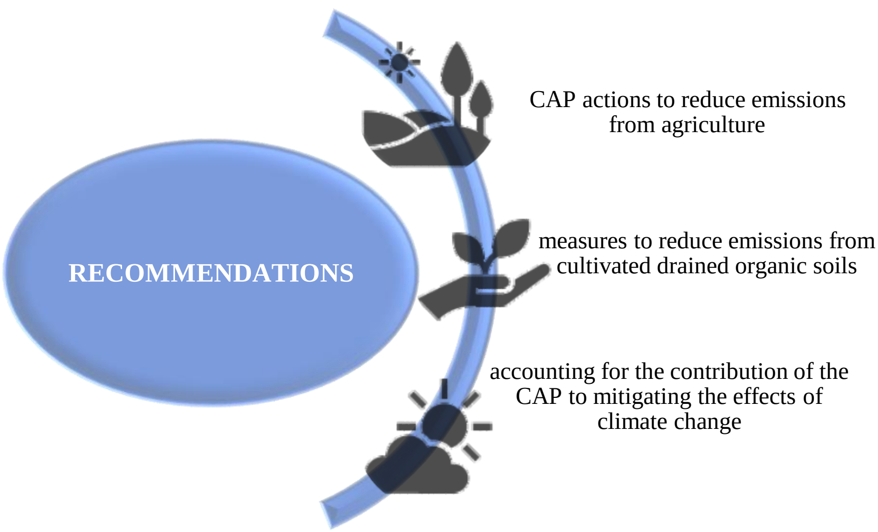

Figure 1. Main recommendations of the European Court of Auditors for the reduction of greenhouse gas emissions in the development of agricultural activity

The first recommendation is related to the role of the European Commission in establishing the objective of reducing greenhouse emissions from agricultural activity in the territory of each European country, evaluating the CAP strategic plans and presenting incentives to reduce greenhouse gas emissions. The second recommendation to reduce emissions from cultivated drained organic soils is related to the measures to introduce a monitoring system in impact assessment after 2020 on peatlands and wetlands and direct payments for rural development and other CO_2 sequestration measures with a deadline for implementation – September 2024. The third recommendation for accounting for the contribution of the CAP to mitigating the consequences of climate change until 2030 is aimed at systematizing important monitoring indicators regarding the impact of the CAP for the period 2021 – 2027 of the measures taken to climate change mitigation on net greenhouse emissions. Also, this recommendation is related to applying the "polluter pays" rule on emissions from agricultural activities and incentivizing farmers to absorb carbon in the long term. The implementation of the first and third recommendations is until December last year. In principle, Bulgaria fulfills a general goal of reducing greenhouse gas emissions by at least 40% by 2030 (Ministry of environment and water, 2024).

In connection with the implementation of the given recommendations, the aspiration of each country is increasing, incl. Bulgaria for taking specific decisions and initiatives in the problem area. For example, at the AGRA-2024 exhibition, the Bulgarian company INOVEX Group presented the possibilities of carbon farming, through the participation of agricultural producers in a soil carbon certification program[1]. (INOVEX). At the end of July this year, the light projection "Horizon" of the National Palace of Culture, Sofia visualized messages about climate change, the important role of science in finding solutions and the personal responsibility of people[2]. At the same time, state institutions, non-governmental organizations and in a number of Bulgarian educational institutions are conducting initiatives in relation to climate change and possible solutions for mitigating the consequences.

From an audit report on the inventories of greenhouse gases in the EU-27 for the period 1990 – 2018 it is clear that in the period 1990 – 2010 they decreased by 25% mainly due to the decrease in the use of fertilizers and in the number of farm animals, with the largest decrease in the period 1990 – 1994. After 2010, emissions did not decrease more (European Court of Auditors, 2021).

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[1] INOVEX Group is in partnership with the company Agreena (Denmark). Agreena Carbon is the world's largest soil carbon certification program accredited to monitor, quantify, validate and verify carbon sequestration and emission reductions.

[2] Bulgaria and MoEW are hosting the 61st plenary session of the Intergovernmental Panel on Climate Change (Intergovernmental Panel on Climate Change, IPCC) in Sofia under the Horizon 2024 project. By August 2, nearly 500 delegates from the panel's 150 member states discussed issues related to the organization's reporting during the Seventh Review Cycle, which begins in July 2023.

For the purpose of the analysis regarding the ecological status of the studied regions, the greenhouse gas emissions expressed in kton CO_2 were considered, using the values of the global warming potential (GWP – 100) from the IPCC AR5 (Intergovernmental Panel on Climate Change, 2014). In this case, we analyze data for main gas components – Fossil CO_2, N_2O, CH_4, AR5[1]. Carbon dioxide emissions on the territory of a country are an important indicator and they have the largest share of greenhouse gases contributing to global warming and climate change. For greater completeness, when assessing the impact on climate change in our country, gases such as methane and nitrous oxide are also analyzed.
From the Long-Year Emission Data Base for Global Atmospheric Research – EDGAR (EDGAR, 2023) and (Crippa, Guizzardi, Pagani, & Pisoni, 2023) the data with 3 main components in the sector – agriculture have been selected (in another author's publication other economic sectors are also considered) for all statistical regions in Bulgaria. The changes in values compared to 1990, which was accepted as a reference year in terms of the level of emissions, 2007 (Bulgaria was accepted as a member of the EU) and the last 5-year period 2018 – 2022 of the available data were tracked from the available statistical information.
Table 1 presents the data on the level of *CO_2 emissions* in 1990 (reference year), 2007 (the year of our membership in the EU) and the last five years of available statistical data.
The analysis of the dynamics in relation to the level of CO_2 shows that all six regions are characterized by a significant decrease in values in 2007, compared to the base year 1990. The percentage decrease is greatest in the North – Central and North – Eastern regions (–83,48), and the second place with the same trend is occupied by the Northwest (–57.95). The reduction of emissions for this component is within the limits of –36.1 to –45.3 for the remaining 3 southern regions, with the lowest degree being in the South-West region. It is noteworthy that for the period 2018 – 2022 there is a trend for a steady increase in the indicator compared to both the baseline and the year in which Bulgaria joined the EU member states (2007).

[1] Global warming potentials measure: how much energy shall the emissions of one ton of a gas absorb over a period of time, corresponding to the emissions of one ton of carbon dioxide (CO_2). Microsoft Sustainability Manager allows selection between Intergovernmental Panel on Climate Change (IPCC) Assessment Reports 4, 5 and 6, each with a 100-year time horizon.

Table 1. Dynamics of CO2 greenhouse gas emissions from agricultural activity by planning areas

STATISTICAL REGIONS	**YEARS**						
Fossil CO_2_AR5	**1990**	**2007**	**2018**	**2019**	**2020**	**2021**	**2022**
NWPR	61,36	25,80	62,04	69,56	74,83	86,29	89,12
NCPR	26,88	4,44	23,68	27,00	29,04	32,00	35,27
NEPR	30,63	5,06	26,98	30,76	33,09	36,47	40,20
SEPR	125,85	68,84	135,34	150,72	162,15	190,41	191,51
SWPR	352,79	225,43	395,94	438,94	472,25	561,19	554,68
SCPR	104,92	58,57	113,44	126,25	135,83	159,75	160,31

Source: https://edgar.jrc.ec.europa.eu/dataset_ghg80_nuts2 and own calculations

The following table (table 2) shows the data regarding greenhouse gas emissions from *CH_4 methane*. The emission reductions in 2007 in percentage terms are over 60% for both the northern and southern regions in the range of –63.5% to –66.7%, compared to the base year – 1990.

Table 2. Dynamics of CH4 emissions from agricultural activity by planning areas

STATISTICAL REGIONS	**YEARS**							
CH_4_AR5	**1990**	**2007**	**% of change**	**2018**	**2019**	**2020**	**2021**	**2022**
NWPR	837.03	301.01	–64.04	268.75	258.46	282.19	286.56	289.10
NCPR	1016.04	363.91	–64.18	387.87	374.33	410.24	415.77	419.98
NEPR	949.80	329.62	–65.30	503.53	485.92	533.16	540.26	545.82
SEPR	2578.52	941.18	–63.50	440.99	425.10	464.35	469.78	474.04
SWPR	532.69	178.11	–66.56	139.11	135.42	144.92	146.41	147.46
SCPR	1371.02	456.57	–66.70	343.88	335.21	359.26	361.38	362.41

Source: https://edgar.jrc.ec.europa.eu/dataset_ghg80_nuts2 and own calculations

The analysis for the period 2018 – 2022 shows divergent trends in the individual studied regions. For three of them, NWPR, SEPR and SCPR, a sustainable reduction in emissions is observed not only compared to the baseline, but also compared to 2007. After 2019, a slight increase is reported for NWPR, compared to the previous two years, while for SEPR and SCPR there is a characteristic increase of the values for the last three years of the research period. Despite the decrease in emissions in 2007, for the rest of the 5-year period, an increase is reported for the NCPR and NEPR, especially for the last 3 years. The South-West region is characterized by a decrease that continues until 2019, and for the remaining 3 years the emissions increase again in the range from 144.92 to 147.46.

The dynamics of *nitrous oxide* by planning areas is presented in the table. 3. Here again, the percentage change in emissions is positive, i.e. a significant decrease in 2007 compared to the reference year 1990 (in the range of –58.99 to –62.03).

Table 3. Dynamics of greenhouse gas emissions N2O from agricultural activity by planning areas

STATISTICAL REGIONS	**YEARS**							
N2O _AR5	**1990**	**2007**	**% of change**	**2018**	**2019**	**2020**	**2021**	**2022**
NWPR	794.64	325.89	–58.99	589.55	607.01	625.62	663.68	662.14
NCPR	738.61	299.67	–59.43	544.48	560.09	577.31	612.70	610.94
NEPR	799.11	326.37	–59.16	615.77	633.25	650.96	693.45	690.26
SEPR	923.11	356.66	–61.36	554.90	568.10	590.18	626.36	626.77
SWPR	385.54	148.75	–61.42	230.43	234.24	245.03	258.06	259.94
SCPR	744.48	282.32	–62.03	452.08	459.34	477.74	505.24	506.68

Source: https://edgar.jrc.ec.europa.eu/dataset_ghg80_nuts2 and own calculations

However, for the period 2018 – 2022, a continuous increase in values is characterristic of all studied statistical regions.

Based on the calculated value indicators for the rates of change in the studied regions, a ranking was made for the agriculture sector for three of the components – carbon dioxide, methane and nitrous oxide (CO_2, CH_4 and N_2O).

On the table 4, we have presented the change in *the carbon dioxide* content for the last year of the study period – 2022. The calculations were performed based on the reference year 1990 and the second time – the year Bulgaria became a member of the EU (2007) for greater clarity of the changes that have occurred. Rank one is given to the region with the greatest reduction in harmful emissions, respectively rank 6 to the sector with the greatest increase. The trend of increasing CO_2 values on a national scale is alarming, i.e. on the territory of all studied areas. From the table it is clear that for the component – carbon dioxide, the agriculture sector is with the largest increase in greenhouse gases for the Northwest region (289.10% – rank 6, compared to 1990), while for the North Central region and the Northeast, the percentage change towards increasing gases is more than 9 times lower (31.24 – rank 1).

Table 4. Rate of change of greenhouse gas emissions – Fossil CO_2 and ranking by planning areas

STATISTICAL REGIONS	2022	Change from 1990	Change from 2007	Rank 1990	Rank 2007
NWPR	89.12	**289.10**	245.43	6	4
NCPR	35,27	**31.24**	**694.42**	1	6
NEPR	40.20	**31.24**	**694.42**	1	6
SEPR	191.51	52.18	178.22	2	3
SWPR	554.68	57.22	**146.05**	4	1
SCPR	160,31	52.79	173.72	3	2

Source: https://edgar.jrc.ec.europa.eu/dataset_ghg80_nuts2 and own calculations

When tracking the change from the 2007 base year, the trend reverses, with the North Central and Northeast regions repositioning in the rankings from first to sixth (694.42). The South West region has the lowest values at 146.05 or rank 1.

The rate of change of *methane emissions* and the ranking by planning areas is shown in the table. 5. Unlike carbon dioxide, the change here is unidirectional both compared to the base year 1990 and also compared to 2007.

Table 5. Rate of change of greenhouse gas emissions – CH_4 and ranking by planning areas

STATISTICALLY REGIONS	2022	Amendment compared to 1990	Amendment compared to 2007	Rank 1990	Rank 2007
NWPR	289.10	–65.46	–3.96	4	4
NCPR	419.98	–58.67	15.41	5	5
NEPR	545.82	**–42.53**	**65.59**	6	6
SEPR	474.04	**–81.62**	–49.63	1	1
SWPR	147.46	–72.32	–17.21	3	3
SCPR	362.41	–73.57	–20.62	2	2

Source: https://edgar.jrc.ec.europa.eu/dataset_ghg80_nuts2 and own calculations

The regional differences when comparing the values in 2022 compared to 1990 are in the positive direction, i.e. reduction in each of the 6 planning areas. In this sense, the decrease in methane emissions is greatest in the Southeast region (–81.62) or rank 1, and least in the Northeast (–42.53). The same trend in terms of ranking applies when compared to the base year 2007, but the difference is in the North East region and the North Central region, where the values increase (65.59 and 15.41).

However, it is striking that the ranking from 1st to 6th rank remains identical in all the studied regions, i.e. in the sequence presented in the table.
The analysis of the data from tab. 6 for the *nitrogen dioxide component* show a decrease in greenhouse gas emissions compared to 1990 in both the northern and southern regions, i.e. on the entire Bulgarian territory. The positive trend is most pronounced in the South-West region (rank 1, –32.58) and weakest in the North-East (rank 6, –13.62). Unfortunately, however, the change compared to 2007 is negative in the direction of an increase in greenhouse gas emissions – N_2O, with the South – West planning region in first place and the North – East planning region in sixth place.

Table 6. Rate of change of greenhouse gas emissions – N_2O and ranking by planning areas

STATISTICALLY DISTRICTS	2022	Amendment compared to 1990	Amendment compared to 2007	Rank 1990	Rank 2007
NWPR	662.14	–16.67	103.18	5	4
NCPR	610.94	–17.28	103.87	4	5
NEPR	690.26	**–13.62**	**111.50**	6	6
SEPR	626.77	–32.10	75.73	3	2
SWPR	259.94	**–32.58**	**74,75**	1	1
SCPR	506.68	–31.94	79.47	2	3

Source: https://edgar.jrc.ec.europa.eu/dataset_ghg80_nuts2 and own calculations

The analysis of the data used and the author's calculations confirm the need for urgent and adequate solutions to adapt the agricultural sector to alternative and sustainable production processes that can reduce the ecological footprint of the business units. Despite the efforts made by the state institutions, this issue is on the agenda and requires timely and innovative solutions in the transforming economic environment towards sustainability. In this regard, the role and contribution of agrarian business to the achievement of the climate goals is increasingly growing and will continue to grow in the future.

Conclusion

1. A steady trend towards decreasing CO_2 values from agricultural activity in 2007 compared to the base year 1990 was found in the six planning areas. The most sensitive is the decrease for the North-Central and North-East regions (–83.48), followed by the North – West (–57.95). The decrease was the lowest in the Southwest region (–36.1). The trend of increasing carbon dioxide for the period 2018 – 2022 compared to both the base year 1990 and the year Bulgaria became

a member of the EU (2007) is alarming. An increase is reported in the NCPR and SEPR, especially for the last 3 years. In the Southwest region, a positive downward trend is observed until 2019, while for the remaining 3 years emissions increase again within the range from 144.92 to 147.46.

2. Methane emissions from the activity of the agricultural sector in 2007 were reduced by more than 60% for both the northern and southern regions in the range of –63.5% to –66.7%, compared to the base year – 1990. For the period 2018 – 2022, a two-way trend is observed – a decrease or an increase in the studied areas. Despite the decrease in emissions in 2007, for the studied 5-year period, an increase is reported for the NCPR and NEPR, especially for the last 3 years. For the Southwest region, the reduction continues until 2019, and for the remaining 3 years emissions increase again.
3. The dynamics of nitrous oxide in the agricultural sector by planning regions is characterized by a significant decrease in 2007 (in the range from –58.99 to –62.03). However, in all the studied statistical regions, a negative trend of continuous increase in values is reported for the 5-year period (2018 – 2022).
4. The ranking of the studied areas under the CO_2 component depending on the rates of change of harmful emissions from the activity of the agricultural sector in 2022 compared to 1990 and 2007 shows that the North Central and North Eastern regions are repositioning from first to sixth rank (694.42), while the Southwest region has the lowest values –146.05 or rank 1.
5. The trend in terms of the rate of change of methane emissions in 2022 compared to 1990 and also compared to 2007 is positive. The reduction of methane emissions is the largest in the South-East region (–81.62) – rank 1, and the least in the North-East (–42.53). When compared to the base year 2007, negative regional differences are observed in the Northeast and North Central regions, where the values increase (65.59 and 15.41). The sequence of positioning from the 1st to the 6th rank is kept identical for all the studied areas in both cases.
6. For the northern and southern regions of Bulgaria in 2022, a decrease in greenhouse gas emissions for the nitrogen dioxide component was found compared to 1990, but the change compared to 2007 is negative in the direction of an increase in greenhouse gas emissions – Southwest (rank 1) and the Northeast Planning Region (rank 6).

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INSTITUTIONS AND MANDATES FOR CLIMATE CHANGE ADAPTATION IN BULGARIAN RURAL AREAS

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Abstract
Climate change is undeniably the leading challenge in the 21st century (IPCC 2022). Agriculture is simultaneously a major driver of climate change and is seriously affected by it (EEA, 2019). The adaptation efforts and the level of readiness to adapt to climate change vary between regions, countries and sectors (e.g. agriculture and environment). The overall goal of the research is to assess the level of readiness for climate change adaptation of the agricultural and environmental institutions in Bulgaria. The specific objective of the paper is to analyze their institutional setups and mandates for adapting to climate change in the Bulgarian rural areas. The research findings and results will support the identification of enabling conditions and key barriers to stronger institutional adaptation capacities of the main agricultural and environmental institutions in the country. The assessment is based on documentary analysis of the national climate adaptation strategy and the legal acts, regulating the institutions' mandates and functions. The methodological approach is motivated by the conceptual model developed by Ford and King (2015) for assessing the climate adaptation readiness by governments at various scales. The focus is on three of their adaptation readiness factors – political leadership on adaptation, institutional organization for adaptation and adaptation decision making. The results indicate a reactive rather than proactive political leadership on climate adaptation in Bulgaria. The institutional organization for adaptation suffers serious understaffing in the Ministry of Environment and Water and in the relevance sectoral ministries. The Strategy on Climate Change and Adaptation stated the need for increased capacities and training in sectoral institutions and stakeholders in 2019. In 2023, there is only one environmental institution with an official mandate on climate change – the Climate Policy Department in the Ministry of Environment and Water. Its mandate is on policy development at the global, European and national level addressing both mitigation and adaptation needs; and it is the smallest unit in the ministry in terms of staff numbers. The other environmental institution with a mandate on climate change is the Executive Environmental Agency which monitors the greenhouse gas emissions and the related permits and registers, with no explicit mandate on climate adaptation. As regards the agriculture and rural development institutions, the Rural Development Directorate in the Ministry of Agriculture has a mandate to propose measures addressing climate change needs during the programming of the Common Agricultural Policy Strategic Plan 2023 – 2027. The identified needs (i.e. introduce climate adapted breeds and plant species) relate to the farming sector and not to the rural areas. Overall, the key weakness of the Bulgarian climate adaptation approach in rural areas is its reactive and ad-hoc basis. It either is driven by EU regulations and requirements or is implemented when project opportunities arise, without systemic planning and ownership of responsibility in the agriculture or environmental institutions.

Key words: climate change governance, adaptation readiness, agriculture
JEL code*: Q54, Q58, Q18*

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Background

Climate change is undeniably the leading challenge for the global community in the 21st century (IPCC, 2022). The efforts to limit the climate disrupting emissions (mitigation) while at the same time, prepare for the adverse effects from the ongoing weather extremes (adaptation) strain political and institutional capacities at different governance levels. Agriculture is an exemplar sector for both being a major driver of climate change and for being seriously affected by it (EEA, 2019).

Overall adaptation efforts have increased significantly but are still "unequally distributed across regions" and "fragmented, small in scale, incremental, sector-specific, designed to respond to current impacts or near-term risks, and focused more on planning rather than implementation" (IPCC, 2022). The largest adaptation gaps exist among lower income population groups, among which small-scale agriculture producers and rural inhabitants.

Both the scientific community and practitioners aim to contribute to the understanding of the adaptation needs and gaps of the enabling capacities and institutional readiness across sectors and governance levels, e.g. national adaptation capacity frameworks (Berrang-Ford et al., 2019; Dixit et al., 2012; Ford & King, 2015), local adaptation capacity framework (Aguiar et al., 2018; Jones et al., 2010;), agriculture and forestry adaptation (Ignaciuk, 2015; Vizinho et al., 2021; Zhao et al., 2022) and the interaction between them (Barr & Lemieux, 2021; Darjee et al., 2021; Ford et al., 2017; Huitema et al., 2016; Olazabal et al., 2019).

The overall objective of the research is to assess the level of readiness for climate change adaptation of the agricultural and environmental institutions in Bulgaria. The specific objective of the paper is to analyze their institutional setups and mandates for adapting to climate change in the Bulgarian rural areas. The research findings and results will support the identification of enabling conditions and key barriers to stronger institutional adaptation capacities of the main agricultural and environmental institutions in the country. This is the first step of assessing the level of readiness for climate adaptation in the rural areas in Bulgaria.

Methodological Approach

The study of climate adaptation mandates is motivated by the six adaptation readiness factors, developed by Ford and King (2015). They proposed a conceptual model "*to assess readiness with regard to planned adaptation by governments at various scales*" by six factors that were "*essential for adaptation to take place and without which adaptation was unlikely to occur*" (Table 1).

The assessment of the Bulgarian governance set up and mandates is based on documentary analysis of the national climate adaptation strategy and the legal acts, regulating the institutions' mandates and functions. The focus is on three of the adaptation readiness factors – political leadership on adaptation, institutional organization for adaptation and adaptation decision making and stakeholder engagement. Thus, the scope of the analysis is at the national level.

Table 1. Factors relevant to adaptation readiness

Factor	Assessment options
Political leadership on adaptation	Statements from leaders on the importance of adaptation, creation of national adaptation strategies, development of legal mandates, including in departments and governmental plans.
Institutional organization for adaptation	Existence of political and administrative structures that foster or limit adaptation.
Adaptation decision making and stakeholder engagement	Proactive inclusion of stakeholders and communities in decision-making about planning, implementation and monitoring.
Availability of usable science to inform decision-making	Quality, timely and reliable science available to inform decision-making and implementation of actions.
Funding for adaptation planning, implementation and evaluation	Specific funding and resources dedicated to adaptation efforts, including capital, maintenance and human resources for both research and actions.
Public support for adaptation	Public opinion and perception of risks as an influence on decision making and implementation
Interlinkages among factors	Factors that are contingent on other factors or reinforce each other. Tension between factors, limit or override each other.

Source: Adapted from Ford and King (2015), and Ford et al. (2017)

National adaptation governance set up and institution's mandates

1. Political leadership on adaptation

In Bulgaria, the ultimate responsibility for climate policy is with the Parliament, as stipulated in the Climate Change Mitigation Law. The Council of Ministers has the overall responsibility of any policy implementation. The climate policy is within the competences of the Ministry of Environment and Water (MoEW). The Bulgarian Climate Coalition[1] advocated for over a decade the need for recognizing the high priority of climate policy and action. The first indication of the high level of political importance of climate change was given at the end of 2021, when a deputy prime minister on climate was appointed. However, the government was short-lived (13 December 2021 – 22 June 2022) and the next government did not renew either the priority or the position. Thus, climate remained one among equal policy topics in MoEW; the ministry not even (re)named as ministry of environment (water) and climate.

[1] https://climatebg.org/en/documents/stanovishta/

The Climate Change Mitigation Law, adopted in 2014 and amended several times after that, was the only legal act on climate. Its focus was on climate mitigation as its title indicated. Nevertheless, climate adaptation was referred to in several articles aiming to "*ensure the long-term planning of measures on climate change adaptation*". The availability of national strategy and/or action plan, which is another indicator of political importance, was prompted by the European Union (EU) climate policy. Bulgaria was among the last EU states to adopt a National Climate Change and Adaptation Strategy and Action Plan in 2019. For comparison, 20 EU member states had adopted national climate adaptation strategies by 2015 (Aguiar et al., 2018). The Climate Change and Adaptation Strategy provided a baseline assessment and sectors' prioritization (agriculture among them).
In 2023, Bulgaria was one of the only four EU member states (the other three were Germany, Hungary and Slovenia) that provided only the mandatory reporting with no additional information on climate adaptation[1].
The delays in developing and adopting climate adaptation policies and the lack of high-level political positions on climate change indicate a reactive rather than proactive political leadership on adaptation.

2. Institutional organization for adaptation

MoEW established a Climate Policy Directorate with a broad climate mitigation and adaptation policy mandate. The responsibilities comprised developing legal acts, coordinating the development and implementation of the national climate policy as well as coordinating the work of other ministries and institutions in relation to the national climate policy (art. 38, RCM 208/2023). However, it is the smallest specialized unit in the MoEW with only 11 staff members. In comparison, the Air Quality Directorate has 13 staff, the Water Management and Waste Management Directorates have respectively 24 and 23 staff, and the Nature Conservation Directorate – 32. At the same time, none of the subordinate MoEW institutions – the Regional Inspectorates, the River-Basin Management Directorates or the Executive Environmental Agency received an official climate adaptation mandate (Table 2).
The Climate Change Mitigation Law and the Third National Plan on Climate Change Mitigation 2013 – 2020 (3rdNPCCM) planned for the setting up of dedicated climate units in the related ministries, including in the Ministry of Agriculture (MoA). In 2022, the final implementation report of the 3rdNPCCM disclosed that the MoA declined the setting up of such unit. The justification provided was the "*cross cutting character of climate change affecting the work of multiple units in the MoA system*" (p. 32). The MoA stated that the "*existing structure was sufficient to ensure a good coordination of issues requiring a complex approach and comple-*

[1] https://climate-adapt.eea.europa.eu/en/countries-regions/countries

mentarity”. The functional structure regulations of the agriculture institutions revealed that there was only one unit in the MoA with official climate related functions. This was the Rural Development Directorate, which was responsible for the programming of the Common Agriculture Policy (CAP) support. One of its over 15 other functions was to “*program appropriate measures and schemes to combat climate change, to protect soils, biodiversity and water resources, through which to ensure the fulfilment of commitments related to the environment and climate, arising from the applicable European legislation for the European Structural and Investment Funds*” (art. 38(1) p. 11), RCM 260/2019). Again, climate change was one of four environmental issues to be addressed.

Table 2. Climate mandates as regulated in the legal acts on the institutions' functioning

Institution	Climate	Mitigation	Adaptation	Directorate	Legal act
Environment institutions					
Ministry of Environment and Water	x	x	x	Climate Change Policy	RCM 208/2017, 2023*
Executive Environmental Agency	x	x	.	Environment Monitoring, Permits	RCM 331/17.10.2022
Regional Inspectorates Environment and Water	.	.	.	.	MoEW, SG 54/2020
River-basin Directorates	.	.	.	.	MoEW, SG 54/2020
Agriculture Institutions					
Ministry of Agriculture and Food	x	.	.	Rural Development	RCM 260/2019
State Fund Agriculture	.	.	.	.	RCM 151/2012, 2020*
District Directorates on Agriculture	x	.	.	Agriculture Development	MoA, SG 41/2022
National Agriculture Advisory Service	.	.	.	.	MoA, SG 25/2022
Exec Agency Fisheries & Aquaculture	.	.	.	.	RCM 95/2010, 2020*
Food Risk Assessment Center	.	.	.	.	RCM 231/2016, 2020*
Bulgarian Agency on Food Safety	.	.	.	.	RCM 35/2011, 2020*
Executive Agency for Combating Hail	.	.	.	.	RCM 85/2000, 2021*
Agriculture Academy	.	.	.	.	RCM 151/2018, 2022*
Executive Forestry Agency	x	x	.	Forest Management	RCM 173/2011, 2022*

*Notes: Resolution of the Council of Ministers (RCM)/ Order of respective minister in State Gazette (SG); * year of latest change*

Source: Own compilation

The other MoA institution with climate related responsibilities was the Executive Forestry Agency. Its Forest Management Directorate had two functions related to climate change mitigation – to participate in intra-institutional meetings and working groups and to develop and implement projects on climate change mitigation in forests. None of the functions mentioned explicitly climate adaptation responsibilities.
The 2019 Climate Change and Adaptation Strategy assessed the institutional capacity on climate change adaption as needing improvement "*at all levels and in all sectors*". The proposed focus was on "*building expertise, training of the administration and stakeholders, the knowledge base, monitoring and research to enable and support adaptation actions*" (CCAS, 2019). The current review underlines that before building expertise there is an urgent need to build up the institutional mandates on climate adaptation and to strengthen the only existing institutional unit with a dedicated mandate on climate mitigation and adaptation policy as well as to establish the units in the relevant ministries and institutions.

3. Adaptation decision making and stakeholder engagement

The public bodies' decision-making on climate issues was regulated in the Climate Change Mitigation Law. It stipulated that a National Expert Council on Climate Change supported the Minister of Environment and Water. Thus, the Council was established as a consultative body. Its members comprised representatives of nine other ministries, the Executive Environmental Agency, the Bulgarian Academy of Science, the Association of Municipalities as well as other non-governmental bodies. The Ministry of Agriculture and Food was one of the members.
The operation of the Consultative Council was regulated by an Order of the Minister of Environment and Water. The draft text of the order (the only available version on the MoEW website) stipulated that its operating principles were transparency, publicity and equality among its members. An assessment by Climate Action Network in Europe stated that it "*does not function with transparency and accountability since neither its members not its decisions or protocols of meetings are available or accessible online*" (Peev, 2022). Indeed, not even the approved rules of procedure of the Council were published.

Conclusion

The institutions' approach to climate change positions adaptation secondary to mitigation – the law is focused on mitigation; there are already three action plans focused on mitigation, and only one on adaptation. There is a single institution with a mandate on climate change adaptation – the Climate Policy Department in the MoEW. Two other institutions have specific climate change mandates but they are focused on mitigation – the Executive Environmental Agency and Executive Forestry Agency. The Rural Development Directorate has a rather general mandate for developing climate change measures with no specific focus on adaptation.

Coordination on climate change adaptation seems to be one-sided. The 2019 Climate Change and Adaptation Strategy indicated the necessary actions in terms of institutional setting and capacity building, but the MoA declined the dedicated unit. Nevertheless, certain adaptation measures were planned and activities implemented. The CAP Strategic Plan 2023-2037, coordinated by the MoA and the Rural Development Directorate, identified needs of very high priority, some of which directly related to climate change adaptation such as the introduction of climate-adapted species and varieties and sustainable forestry, implementation of conservation, integrated and organic farming and soil carbon sequestration.

The National Agriculture Advisory Service trained several hundred farmers on certain aspects of climate adaptation actions in the framework of non-climate related projects.

The weakness in this approach is its ad-hoc basis – it is driven either by EU requirements or by opportunity projects and on the good will of the staff in the public administration and not on clear official mandates. If it was not in the EU Regulation on CAP Strategic Plans or the project funding was not available, there would not have been either of the positive outcomes.

Research indicates, "*The most effective adaptation efforts usually happen where there is a single coordinating body leading the adaptation process"* (Ford et al., 2017). If the individual ministries decline the responsibility, then the higher-level decision-making should make sure that climate change adaptation in rural areas and agriculture is addressed properly.

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ECOLOGICAL RISK ASSESSMENT IN BULGARIA

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Abstract
The pollution of natural resources in Bulgaria and the pressure on ecosystems make environmental risk assessment a necessary tool to overcome or reduce the environmental challenges in the country. Many environmental challenges make the topic of ecological risk assessment in Bulgaria actual and of significant public importance. The causes of ecological risks are complex. With increasing environmental challenges, the assessment of these risks become more complicated and comprehensive and the assessment process in both global and regional contexts is dynamic, developing and changing. Risk assessment is a necessary tool for identifying environmental threats in order to be undertaken a response regarding them. The aim of the paper is to assess the ecological risk in Bulgaria, on this basis to identify the types of ecological risks and outline proposals for their prevention. The methodological framework of the article includes a theoretical review of ecological risk assessment, analysis of environmental indicators in Bulgaria for the period 2013 – 2022, assessment of environmental risks in Bulgaria based on a survey. The risk indicators that were assessed are contamination of land resources, contamination of water resources, air quality pollution, biodiversity damage, natural disaster, toxic waste contamination, radiation, pesticide contamination, extreme temperatures and climate change. On the basis of the analyses and assessments, generalized conclusions, proposals and recommendations for ecological risk reduction are prepared. Almost all environmental risks assessed are identified as critical, and the strategy that would be most appropriate to address critical risks is risk avoidance. The recommendations that are proposed are as follows: 1) at institutional level – implementation of systems for continuous monitoring of critical environmental indicators, developing early warning systems for natural disasters and climate change, supporting environmental projects and initiatives, and organizing educational campaigns to raise public awareness; 2) at business level – investment in fixed tangible assets with an environmental purpose, renewing facilities and equipment, investing in safe innovative green technologies, optimizing production processes and reducing production waste, building sustainable supply chains and incorporating sustainability into corporate social responsibility; 3) at community and the individual level – collective efforts involving education and awareness raising, sustainable urban planning, effective waste management, public participation and volunteering. These and other measures can help to promote environmental awareness among consumers, while at the same time to be supported policy decisions and initiatives that contribute to sustainable development. Implementing environmentally measures and activities at all levels – institutional, business and community in response to the threats would have a synergistic effect in terms of reducing ecological risk and overcoming environmental challenges.
Key words: ecological risk, assessment, environment
JEL: Q15, Q54

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Introduction

The environment is exposed to a multitude of ecological risks, the causes of which are most often complex. Ecological risk assessment is carried out to predict the probability of an event occurrence that would have an adverse ecological effect on individuals or ecosystems (Norton et all, 1992). Solomon and Sibley (2002) add that the purpose of ecological risk assessment is to predict the adverse effects on communities of species at places that are potentially exposed to contaminants and other harmful substances. Marinova (2023) perceives ecological risk assessment as a scientific study that assesses negative environmental impacts using facts and predictions. Chen et all (2013) relates ecological risk assessment to the probability of an adverse ecological situation occurring due to natural or anthropogenic processes that will adversely affect an ecosystem. Of interest is the view of Hope (2006), who considers ecological risk assessment in terms of the need to its development due to the intensifying environmental challenges. He argues that ecological risk assessment is changing as it moves from assessing negative impacts, which have mostly been spread spatially on a small territory in the past, to complex and comprehensive ecological assessments of impacts on entire populations and communities.

The pollution of natural resources in Bulgaria and the pressure on ecosystems make environmental risk assessment a necessary tool for overcoming or reducing environmental challenges in the country. Borisov, Saikov (2024) making a risk assessment, found that air pollution, waste management and climate change are the environmental risks that Bulgaria will face in the next decade. Dust, sulphur dioxide, nitrogen oxides, lead aerosols, ammonia, etc. are the main air pollutants in Bulgaria, with exceedances of the maximum allowable concentrations leading to environmental pollution and negative consequences for ecosystems and human health (Velikov, 2017). Penchev (2012) defines the air quality in certain regions and large settlements in Bulgaria as unsatisfactory. In addition to air pollution, contamination of water resources is also observed. Regardless of a positive trend of improving water quality, there are water bodies identified at risk, groundwater contamination with nitrates, and prerequisites for the emergence of water deficit in some areas of the country (MEW, 2023). The analysis of the socio-economic development of the country after its accession to the EU (2019) also considers risks related to biodiversity loss due to urban infrastructure development, intensive agricultural practices, and due to overexploitation of species of economic importance. All this and many other environmental challenges make the topic of ecological risk assessment in Bulgaria actual and of significant public importance.

Methodology

The aim of the paper is to assess the ecological risk in Bulgaria, on this basis to identify the types of ecological risk and outline proposals for their prevention.

The methodological framework of the paper includes a theoretical review of ecological risk assessment, analysis of environmental indicators in Bulgaria for the period 2013 – 2022, assessment of ecological risk in Bulgaria based on a survey. On the basis of the analyses and assessments, generalized conclusions and proposals for environmental risk reduction are prepared.

The risk assessment is based on a survey conducted in 2023 – 2024 year among 150 business organizations from different economic sectors, spread throughout the country. To assess the environmental risk, respondents evaluate the probability that the risk event will occur and the impact that is expected as a result of the event occurring.

Each environmental risk is rated on a scale of 1 to 5, with 1 – very low probability of occurrence and 5 – very high probability. In terms of impact, 1 is negligible impact and 5 is catastrophic.

On the basis of the risk assessment, a risk matrix is prepared, which contains the combination of probability and impact and enables the classification of ecological risks into critical risks (high probability and high impact), unforeseen risks (low probability and high impact), systematic risks (high probability and low impact), and irrelevant risks (low probability and low impact) (Operational Program for Regional Development, 2007). Figure 1 presents as the risk matrix, so the risk response matrix. According the risk response matrix if the risk is critical, so the response is to avoid the risk. For the unforeseen risk is used the strategy of mitigation, for the irrelevant risk the used strategy is risk acceptance and for the systematic risk – strategy for transferring the risk (Washington State Department of Transportation, 2014).

A risk rating is also calculated for each ecological risk as the multiplication between the probability and impact scores.

The following risk indicators were assessed:

- ✓ Contamination of land resources;
- ✓ Contamination of water resources;
- ✓ Air quality pollution;
- ✓ Biodiversity damage;
- ✓ Natural disaster;
- ✓ Toxic waste contamination;
- ✓ Radiation;
- ✓ Pesticide contamination;
- ✓ Extreme temperatures and climate change.

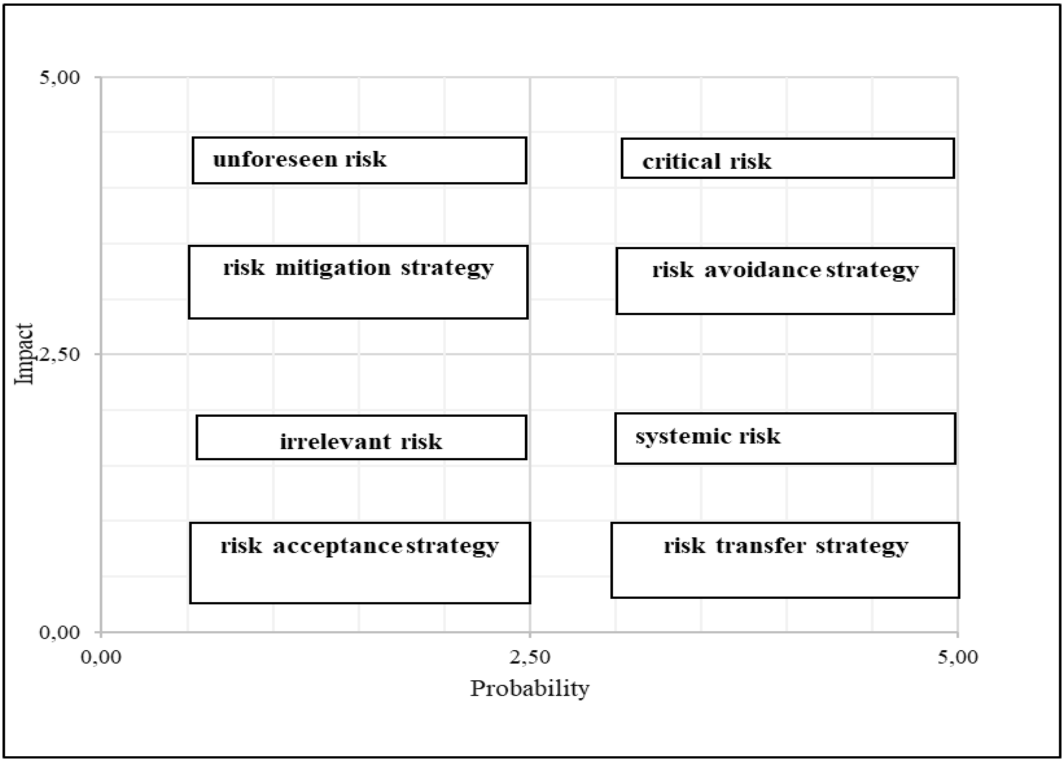

Figure 1. Risk Matrix and risk response matrix

Source: adapted by Operational Program for Regional Development, (2007), Methodology for risk assessment and risk management in relation to the internal control procedures of the OPRD and Washington State Department of Transportation, (2014), Project Risk Management Guide

Analysis of ecological risk and risk assessment in Bulgaria

Table 1 presents data for various environmental indicators in Bulgaria over the period 2013-2022. During the period under consideration, carbon dioxide emissions show fluctuations. The highest level of emissions is in 2015 with 48,204 thousand tones, after which there is a gradual decrease until 2020 (36,644 thousand tones). In 2021 and 2022, emissions increased again to 42,425 and 46,994 thousand tones, respectively. The amount of municipal waste generated over the period analyzed ranges from 2,829 thousand tones to 3,193 thousand tones, with no increasing or decreasing trends. There is a clear downward trend in the amount of wastewater discharged without treatment, from 177 million m^3 in 2013 to 119 million m^3 in 2022. This indicates an improvement in wastewater management over the years. The data on chemical, hazardous waste and other pollutions varies considerably, with 19 cases in 2013 and then decreasing in subsequent years to reach a minimum of 1 – 2 cases in 2017 – 2018. The disturbed territory in 2021 and 2022 is 471 and 472 sq. km., respectively.

Table 1. Environmental indicators in Bulgaria for the period 2013 – 2022

Year	**Carbon dioxide, thousand tones**	**Municipal waste generated, thousand tones**	**Wastewater discharged without treatment, million cubic meters/year**	**Contamination with chemical substances, hazardous waste, municipal waste and others, number**	**Disturbed territory, sq. km.**
2013	42,726	3,135	177	19	
2014	45,251	3,193	182	3	
2015	48,204	3,011	174	8	
2016	45,419	2,881	149	5	
2017	47,521	3,080	131	2	
2018	43,577	2,862	132	1	
2019	42,267	2,838	129	2	
2020	36,644	2,829	127	4	
2021	42,425	3,058	129		471
2022	46,994	3,157	119		472

Source: NSI, Infostat, Data for the period 2013-2022

Tables 2 and table 3 present the distribution of respondents who rated the probability of an indicator occurring, and the extent of its impact in terms of environmental risk. 29% of the respondents rate the probability of air quality pollution occurrence as very high, and a quarter of respondents consider the probability of occurrence of extreme temperatures and climate change to be very high. The probability of water pollution occurrence was rated as high by 28%, pesticide pollution (26%) and the occurrence of a natural disaster (22%). Around and above one third of the respondents considered the probability of occurrence of land resources contamination (41%), natural disaster (39%), water resources contamination (32%), extreme temperature and climate changes (32%) as medium. 29% of respondents rated the probability of occurrence of radiation as very low.

Table 2. Distribution of respondents' assessments of the probability of an environmental risk event occurrence, %

Risk	Probability				
	Very high	**High**	**Medium**	**Low**	**Very low**
Contamination of land resources	19	19	41	13	8
Contamination of water resources	21	28	32	14	5
Air quality pollution	29	19	29	18	6
Biodiversity damage	19	19	35	21	6
Natural disaster	14	22	39	19	5
Toxic waste contamination	11	17	29	28	15
Radiation	11	10	22	27	29
Pesticide contamination	15	26	28	23	9
Extreme temperatures and climate change	25	18	32	14	11

Source: own survey

A very small part of respondents (4 to 9%) considered that the impact of an environmental risk events would be insignificant. Critical impacts would be due to biodiversity damage (51%), land contamination (48%), pesticide contamination (39%), natural disaster (38%), extreme temperatures and climate change (38%).

Table 3. Distribution of respondents' assessments of the degree of impact when an environmental risk event occurs, %

Risk	IMPACT				
	Insignificant	**Almost insignificant**	**Critical**	**Highly critical**	**Catastrophic**
Contamination of land resources	5	15	48	27	5
Contamination of water resources	4	7	36	43	9
Air quality pollution	5	9	32	43	12
Biodiversity damage	5	15	51	23	5
Natural disaster	6	5	38	35	15
Toxic waste contamination	5	7	33	39	15
Radiation	7	5	26	42	19
Pesticide contamination	6	9	39	39	8
Extreme temperatures and climate change	9	10	38	35	8

Source: own survey

The impact of the contamination of water resources and air quality pollution were rated as highly critical by 43% of respondents, followed by the radiation (42%) and pesticide and toxic waste contamination by 39%. Impacts from radiation were rated as catastrophic by 19% of the respondents, followed by the occurrence of a natural disaster by 15% and toxic waste pollution by 15%.
The risk rating calculations show that there are no identified indicators with a high-risk rating (Table 4). Indicators such as Toxic Waste Contamination and Radiation have the lowest rating, while Water Resources Contamination and Air Quality Contamination have the highest rating. Natural Disasters and Extreme Temperature and Climate Change also stand out with a high overall rating due to the high impact and relatively high probability of occurrence.

Table 4. Environmental risk rating

Risk	**Probability**	**Impact**	**Rating**
Contamination of land resources	3,3	3,1	10,2
Contamination of water resources	3,5	3,5	12,0
Air quality pollution	3,5	3,5	12,1
Biodiversity damage	3,3	3,1	10,0
Natural disaster	3,2	3,5	11,2
Toxic waste contamination	2,8	3,5	9,8
Radiation	2,5	3,6	8,9
Pesticide contamination	3,2	3,3	10,5
Extreme temperatures and climate change	3,3	3,2	10,8

Source: own survey

The Ecological risk matrix is presented on figure 2.
The classification of types of risk according to the assessed indicators shows that almost all the indicators – Land Resource Contamination, Water Resource Contamination, Air Quality Contamination, Biodiversity Damage, Natural Disaster, Toxic Waste Contamination, Pesticide Contamination and Extreme Temperature and Climate Change are identified as critical risks (Figure 2). These indicators are assessed to have a high impact and a high probability of occurrence, requiring particular attention in risk management. Radiation risk falls on the boundary between critical and unforeseen risk types. It has a high impact and around and below medium probability of occurrence.

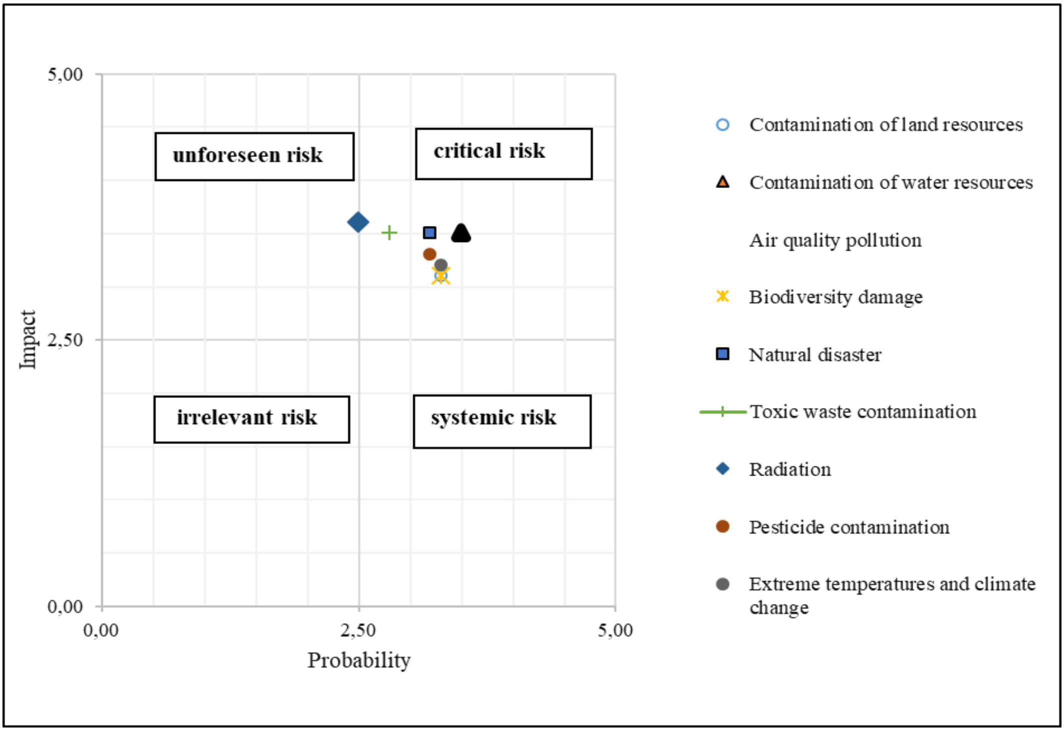

Figure 2. Environmental risk matrix

Source: own survey

Conclusion

Based on the analyses and assessments carried out, the following conclusions and recommendations could be made:

- ✓ In the period 2013 – 2022, different trends are observed in Bulgaria in terms of environmental indicators. Despite fluctuations in carbon dioxide emissions, there is an negative increasing trend. The amount of municipal waste remains unchanged for the period 2013 – 2022. Significant improvement is observed in wastewater management, with a reduction in the volume of wastewater. At the same time, incidents of chemical and hazardous waste pollution also follow a downward trend.
- ✓ Respondents rated air quality pollution and extreme climate change as the risks most likely to occur and with high impact. Water pollution and pesticide contamination are also reported to have a high probability of occurrence. At the same time, a significant part of the respondents considered the probability of occurrence of contamination of land resources and the occurrence of natural disasters as medium. Assessment indicates that the lowest probability of occurrence is of radiation risk.

- ✓ The majority of respondents rate the impact of environmental risks as significant and critical. The most critical impacts are identified as a consequence of biodiversity damage and land resource contamination, while water resource contamination, air pollution, radiation and pesticide contamination are also identified as events with highly critical impacts.
- ✓ Almost all environmental risks assessed are identified as critical, with the exception of radiation risk, which falls on the borderline between critical and unforeseen risks. Indicators such as Land Resource Contamination, Water Resource Contamination, Air Quality Contamination, Biodiversity Damage, Natural Disaster, Toxic Waste Contamination, Pesticide Contamination and Extreme Temperature and Climate Change were identified by respondents as critical environmental risks.
- ✓ Critical environmental risks have a high probability of occurrence and high impact, therefore, they require increased attention and monitoring of risk management activities.
- ✓ The strategy that would be most appropriate to address critical risks is risk avoidance. It should aim to eliminate the cause of the risk.
- ✓ At the institutional level, a risk avoidance strategy can be implemented by building systems for continuous monitoring of critical environmental indicators, developing early warning systems for natural disasters and climate change, supporting environmental projects and initiatives, and organizing educational campaigns to raise public awareness.
- ✓ At the business level, environmental risk avoidance strategy can take actions related to investment in fixed tangible assets with an environmental purpose, renewing facilities and equipment, investing in safe innovative green technologies, optimizing production processes and reducing production waste, building sustainable supply chains and incorporating sustainability into corporate social responsibility.
- ✓ At the level of community and the individual, an ecological risk avoidance strategy can be achieved through collective efforts involving education and awareness raising, sustainable urban planning, effective waste management, public participation and volunteering. These and other measures can help to promote environmental awareness among consumers, while at the same time to be supported policy decisions and initiatives that contribute to sustainable development.

The causes of ecological risks are complex. With increasing environmental challenges, the assessment of these risks become more complex and comprehensive and the assessment process in both global and regional contexts is dynamic, developing and changing. Risk assessment is a necessary tool for identifying environmental threats in order to be undertaken a response regarding them. Implementing environmentally measures and activities at all levels -institutional, business and community in response to the threats would have a synergistic effect in terms of reducing ecological risk and overcoming environmental challenges.

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AGRICULTURAL PRODUCTIVITY, INFLATION AND FARMERS INCOME: A GRANGER CAUSALITY ANALYSIS

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Abstract
Aim: This study aims to explore the relationships among agricultural productivity, inflation, and farmers' income in Greece over a period of 33 years.
Data: The analysis utilizes annual time-series data sourced from the Food and Agriculture Data Network, focusing on Gross Value Added (GVA) in agricultural production, the Producer Price Index (PPI) for agricultural products, and annual average farm household income (AFI).
Results: The Granger causality analysis reveals a bidirectional causal relationship between agricultural productivity and farmers' income. Additionally, a significant impact of productivity on inflation and inflation on income is observed, indicating that changes in agricultural production value precede variations in producer prices.
Conclusions: These findings highlight the complex interactions within the agricultural sector, suggesting that enhancing productivity can improve farmers' income while mitigating inflationary pressures. The study emphasizes the importance of targeted policies to foster sustainable agricultural growth and economic stability in rural communities.
Keywords: Agricultural productivity, Producer Price Index, farm income, causality
JEL: Q11, Q13

Introduction

Agricultural productivity is a cornerstone of economic development, particularly in countries with substantial rural populations and agrarian economies. Advancements in agricultural practices, technology, and efficiency can profoundly impact broader economic indicators, notably inflation and farmers' income, which directly influence economic stability and quality of life in rural areas. Understanding the dynamic interplay between agricultural productivity, inflation, and farmers' income is crucial for formulating effective economic policies.
Inflation, defined as the rate at which the general level of prices for goods and services rises, erodes purchasing power and can create economic uncertainty. For farmers, who often operate on thin margins, even small fluctuations in inflation can

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significantly impact income stability and overall economic well-being. Conversely, farmers' income, which directly affects their living standards and ability to invest in better agricultural practices, is a critical factor in the agricultural productivity equation.

The rise in agricultural prices in 2022, termed as “greed inflation” by the International Monetary Fund (Vinod, 2022), highlights how businesses increased product prices to protect profits amid rising production costs. However, when costs began to decrease, product prices did not decline, worsening the economic pressure on consumers and further distorting inflation patterns. This phenomenon has emerged as a significant threat to both the European and Greek economies, particularly in the domestic food market, as unprecedented increases in consumer prices for basic foods have been observed (Matthews, 2023). Despite the fact that a significant portion of these products is imported, Greek farmers have been unfairly blamed for profiteering, although they are also victims of this inflationary trend.

In 2022, the agricultural sector of the European Union underwent substantial transformations, as reported by Eurostat (2023). The total value of agricultural production reached €537.5 billion at basic prices, representing a noteworthy 19% surge from the previous year. This increase in value was predominantly driven by a significant uptick in nominal prices of agricultural products and services, which escalated by 22.8%. Interestingly, despite a slight decline of 3.1% in production volume, the overall value of agricultural output surged across all EU member states. Particularly notable were France, Germany, Italy, Spain, Poland, the Netherlands, and Romania, which collectively contributed three-quarters of the EU's agricultural production value. Moreover, countries like Estonia, Poland, and Lithuania experienced the highest growth rates, with increases of 44%, 43%, and 42% respectively compared to 2021.

The economic viability of agricultural holdings will be further positively affected by increased productivity due to mechanization and automation. According to the European Commission, this will help the EU's agricultural sector cope with the ongoing labor force outflow and create more opportunities for skilled labor, thereby enhancing the economic attractiveness of the sector (Krings, 2024). By improving productivity, the agricultural sector can better address production costs, ensuring more sustainable income growth for farmers.

In Greece, domestic producer prices for various agricultural products have fluctuated significantly over recent years. For instance, according to Hellenic Statistics Authority (ELSTAT) the price of Greek-produced eggs increased by 8.7% over twelve months, while cow's milk prices decreased by 2.6%. During the same period, consumer prices for dairy and eggs rose by 18%, and the price of raw milk increased by 18.8%. Similarly, the price of soft wheat for baking decreased by 25% for producers, while consumer prices for bread and cereals increased by 11.1% and 14.8%, respectively, while the price of veal for producers saw a modest increase of 3.1%, whereas consumer prices for meat rose by 11.9%. Notably, the producer price for olive oil increased by 62.9%, while consumer prices for olive oil rose by 24.6%. The burden of rising production costs, however, falls heavily on Greek farmers, as from April 2022 to April 2023, the price index for fertilizers increased by 8.2%, continuing a trend of significant price hikes from the previous year. Animal feed prices also rose by 6.2% during the same period, and these rising costs contribute to higher production expenses for farmers, who fight to keep up with the minimal or even declining increases in producer prices.

This study focuses on Greece utilizing econometric techniques and time-series data to explore the relationship of agricultural productivity, inflation and farmers' income. By employing Granger causality analysis, we aim to uncover whether changes in agricultural productivity, variations in inflation rates and fluctuation on farmers' income levels are associated. Granger causality is a statistical hypothesis test for determining whether one time series can predict another, making it an ideal tool for our research.

Methodology

The study utilizes a dataset of annual time-series data of 33 years for Greece, from 1990 to 2022, sourced from the Food and Agriculture Data Network (FAND). Data include three variables:

The study employs three key variables: Gross Value Added (GVA) in agricultural production, the Producer Price Index (PPI) for agricultural products, and the Annual Average Farm Household Income (AFI). The GVA serves as a critical metric, quantifying the economic value generated by the agricultural sector while excluding the costs of inputs and raw materials, thus reflecting the sector's productivity and its contribution to the national economy. The PPI captures the average changes over time in the selling prices received by domestic producers for their agricultural output, providing insights into the inflationary pressures within the sector. Finally, the AFI is employed as an indicator of the financial health and living standards of the agricultural population, making it essential for understanding the interrelationships among agricultural productivity, inflation, and income.

To meet the study’s objective, we implement the Granger causality test (Granger, 1969), an effective method for assessing whether one time series can predict another. Granger causality is preferred than regression analysis as the second can reveal statistical relationships between variables, but it does not establish causality (Lütkepohl, 2005). In contrast, the Granger causality test provides insights into the directionality of these relationships, showing whether changes in one variable precede and potentially influence changes in another.

The models used for the analysis are specified as follows:

$$Y_t = \sum_{i=1}^{m} a_i \, Y_{t-i} + \sum_{i=1}^{m} \beta_i \, X_{t-i} + u_t \tag{1}$$

$$X_t = \sum_{i=1}^{m} \gamma_i \, Y_{t-i} + \sum_{i=1}^{m} \delta_i \, X_{t-i} + \varepsilon_t \tag{2}$$

Based on these, several scenarios can be identified (Gujarati, 2021). If the coefficients of the X_{t-i} variables in equation (1) are statistically significant while the coefficients of the Y_{t-i} variables in equation (2) are not, it indicates unidirectional Granger causality from X to Y. Conversely, if the coefficients of the X_{t-i} variables in equation (1) are not significant but the coefficients of the Y_{t-i} variables in equation (2) are, it indicates unidirectional Granger causality from Y to X. Bidirectional Granger causality occurs if both sets of coefficients are statistically different from zero and finally if neither set of coefficients is significant, it indicates no Granger causality between the variables.

The validity of the Granger causality tests relies on several critical assumptions. First, the time series data must exhibit stationarity, meaning that its statistical properties – such as mean and variance – remain constant over time. This requirement is confirmed through unit root tests, including the Augmented Dickey-Fuller (ADF) test, Phillips-Perron test, and the DF-GLS test, with the study employing the first differences of the variables when necessary. Additionally, the appropriate lag length is paramount for accurate Granger causality testing. The study meticulously determines the optimal number of lags using AIC, SC, and HQ criteria to effectively capture the temporal relationships among the variables. Another fundamental assumption is the linearity of the relationships being examined, as Granger causality analysis presupposes linear interactions among the time series. Furthermore, the tests assume no simultaneity in the relationships, meaning that the causal influences should not occur within the same time period being analyzed. The independence of errors is another vital assumption, where the residuals of the regression models must be independent and identically distributed (i.i.d.), as violations could lead to biased estimates of causal relationships. Lastly, homoscedasticity is assumed, indicating that the variance of the errors remains constant across all levels of the independent variables; heteroscedasticity can undermine the reliability of the findings. Finally, all statistical hypothesis tests are conducted at a 5% significance level.

Results

Based on the Pearson correlation matrix presented in Table 1, Gross Value Added exhibits a positive correlation with both Producer Price Index ($r = 0.335$, $p = 0.018$) and annual average farm household income ($r = 0.300$, $p = 0.040$), with the results indicating that higher levels of GVA are associated with higher values of PPI and AFI and vice versa. In contrast, the correlation between PPI and AFI is weaker, with a correlation coefficient of -0.101, and not statistically significant (p = 0.451), suggesting suggests that changes in producer prices are not related to variations in farm household incomes.

Table 1. Pearson correlation matrix

		GVA	PPI	AFI
GVA	r	1		
	p	-		
PPI	r	0.335	1	
	p	0.018	-	
AFI	r	0.300	–0.101	1
	p	0.040	0.451	-

All variables are set as I(1), based on the ADF test. It is observed that in each case the relevant t-statistics are below the critical values of -3.447 for a 1% significance level and -2.868 for a 5% significance level, an element that is also confirmed by the results of the Phillips-Perron test that uses the same critical values. Additionally, given the critical values of -2.570 for a 1% significance level and -1.941 for a 5% significance level for the DF – GLS test, it is also confirmed that the variables in the analysis are stationary at first differences (Table 2). Consequently, for the Granger causality testing, the first differences of the variables will be used.

Table 2. Unit root tests

	ADF		Phillips-Perron		DF-GLS	
	Level	First difference	Level	First difference	Level	First difference
GVI	–2.261	–16.422**	–2.090	–16.407**	0.080	–6.890**
PPI	–0.632	–17.324**	–1.120	–17.996**	–0.918	–2.164*
AFI	–2.481	–18.619**	-2.624	–29.341**	–1.234	–2.292*

** Denotes stationarity at 5% significance level*
*** Denotes stationarity at 1% significance level*

To test the presence of a causal relationship between agricultural productivity, inflation and farmers' income, the use of 2 lags is chosen based on the agreement of the AIC, SC and HQ criteria (Table 3).

Table 3. Lag length criteria

Lag	AIC	SC	HQ
0	0.171	0.173	0.119
1	–16.597	–15.033	–16.339
2	–16.760*	–15.736*	–16.373*
3	–16.677	–15.111	–16.079
4	–16.503	–14.566	–15.717
5	–16.593	–13.195	–15.610
6	–16.395	–13.636	–15.335
7	–16.396	–13.176	–15.139
8	–16.309	–11.517	–13.775

Based on the Granger causality tests conducted (Table 4), initially the results indicate that Gross Value Added (GVA) demonstrates a unidirectional causal effect on the Producer Price Index (PPI) ($p = 0.010$, suggesting that changes in agricultural production value precede and influence variations in producer prices. Conversely, PPI does not exhibit a causal effect on GVA ($p = 0.417$). GVA and AFI show a bidirectional causal effect highlighting the influence of agricultural productivity on farmers' income levels and vice versa ($p = 0.007$ and $p = 0.015$ respectively). Notably, PPI causes changes in AFI ($p < 0.000$), implying that shifts in producer prices forecast changes in farm household income.

Table 4. Granger causality tests

Null Hypothesis:	F	p
GVA does not Granger Cause PPI	4.228	0.010
PPI does not Granger Cause GVA	0.745	0.417
GVA does not Granger Cause AFI	4.982	0.007
AFI does not Granger Cause GVA	4.210	0.015
PPI does not Granger Cause AFI	5.521	0.000
AFI does not Granger Cause PPI	1.024	0.280

Conclusions

Agricultural productivity plays a pivotal role in driving economic development in rural areas. The study's identification of causal connections between changes in productivity and inflation highlights the sector's significant influence on broader economic trends, as understanding how enhancements in productivity can affect inflationary pressures by impacting producer prices enables policymakers to develop targeted strategies for maintaining price stability and bolstering economic resilience. The bidirectional causality observed between agricultural productivity and farm household income, shows that increased productivity not only enhances incomes but also empowers farmers to invest in technologies and practices that further boost productivity. Conversely, the study reveals that inflation can negatively impact farmers' incomes, emphasizing the need for adaptable policies to mitigate these effects.

Implications

To effectively implement these findings, policymakers should adopt a multifaceted approach with several strategic recommendations. Promoting technological adoption in the agricultural sector is crucial. Governments and agricultural organizations must incentivize farmers to utilize innovative technologies, such as precision agriculture and data-driven decision-making tools. These technologies enhance productivity and reduce costs, leading to improved farmer incomes. Additionally, developing training programs can help bridge the knowledge gap and foster innovation. Improving market access is also vital. Policymakers should invest in infrastructure, such as transportation networks and storage facilities, to facilitate the movement of agricultural goods. Establishing cooperative structures will empower farmers to pool resources and negotiate better prices, thus reducing vulnerability to economic fluctuations. Furthermore, enhancing financial services is essential for farmers' financial management and investment. Developing tailored financial products, including microloans and insurance schemes, and collaborating with financial institutions can improve access to credit. Addressing climate change risks is imperative. Investment in climate-resilient crops and sustainable practices can mitigate adverse effects, while creating awareness and providing necessary training will enhance farmers' adaptive capacity. Lastly, fostering inclusive growth involves empowering marginalized communities, including women and youth, through equal access to resources and training in agriculture, promoting innovation and sustainability in the sector.

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COMPETITIVENESS OF RURAL AREAS: METHODS AND APPROACHES

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Abstract
The study of rural areas' development is a subject of extensive research and analyses. Globalization and the process of digitalization have significantly increased the intensity and changed the characteristics of competition at any level, starting from firms and moving to the level of regions and countries. Research interest and efforts towards understanding, conceptualizing and evaluating competitiveness at regional level are growing, but yet the number of studies on the topic of rural regions' competitiveness are quite limited.
The paper aims at specifying methods and approaches used so far by studies devoted to regional competitiveness and how they could be applied on the level of rural regions. Three are the main sections of the paper. The first one briefly discusses definitions of regional competitiveness, peculiarities of rural regions, and changes of policies for territorial development. A transformation of rural regions is also underlined. They shift from traditional industrial structure (agriculture and labor extensive manufacturing) towards diversification of economic activities, also through being an option for the location of companies that are digital manufacturers. The second section introduces a classification of methods applied to assess the regional competitiveness. They are divided into two groups regarding the approach on which are based. With the first approach the focus is on the output of the system through different indicators. To this group belong indexes developed by worldwide acknowledged organizations as World Economic Forum, International institute for management development, Food and Agriculture Organization, Organization for Economic Co-operation and Development, European Commission, and the World Bank, the Index for measuring regional variation and competitiveness (Huovari et al., 2001), Regional competitiveness index (Dijkstra et al, 2023), and DEA method. The second group of methods are more descriptive and they aim at comprehensive analysis to identify the key drivers of regional development, productivity and economic growth. Among them is the Diamond model of Michael Porter (Porter, 1990). The final section discusses the issue of the applicability of methods used on regional level to assess the competitiveness of the rural regions. Conclusions are derived about the appropriateness of the methods for the assessment of rural areas' competitiveness and a recommendation is given for the benefits of their co-use. One of significant limitations to assess the competitiveness of rural regions is the provision of data. Also, we assume and give some arguments that using a combination of methods, belonging to both groups, would be more effective way to assess the competitiveness of rural regions. The main methods used for the purposes of the research presented in the paper are a desktop research to produce a comprehensive review of the literature, and the methods of analysis and synthesis.
Key words: rural regions, methods to assess regional competitiveness
JEL code: R11, R15

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Introduction

Competitiveness is priority objective of the development policies set about systems on different economic levels – supranational, national, regional, firm, and people themselves. Nevertheless, the significant number of studies about each of the levels, yet that notion has not found the “right” definition. The firm level is considered easier to understand and define competitiveness. On the other hand, national and regional levels are still in search for clearer understanding of what these systems to be competitive. Therefore, the difficulty of finding a single definition about these two levels is the reason why so many definitions or better to say variety in understanding and assessment methods exist.

Michael Porter (1990) is the founder of the theory of microeconomic foundations of competitiveness. By that theory, he reveals the interrelations among different economic levels regarding competitiveness, highlighting the crucial role of firms in driving competitiveness at both regional and national levels.

The paper aims to focus on the adopted approaches and particular methods applied by researchers to assess competitiveness on a regional level and how they could be applied on the level of rural regions. In order to achieve that, the paper is structured as follows: briefly are introduced some of definitions about the regional competitiveness, and in particular, some important peculiarities of rural regions are clarified. These peculiarities need to be considered when choosing a method to assess their level of competitiveness. Then, based on a comprehensive review of the existing literature, are presented and discussed approaches and methods to measure regional competitiveness. The end of the paper discusses and conclude on the appropriateness of the approaches and methods to assess the rural regions’ competitiveness. The research utilizes analysis and synthesis as scientific methods to examine and integrate prior findings and information.

Regions, rural regions and their competitiveness

Sustainable growth and competitiveness become the focal point of territorial policies applied in different countries (OECD, 2005; Kitson et al., 2004, Kovshov et al., 2024). That signifies that the efforts and instruments used by territorial policy were designed in a way not just to prevent the decline in the development of the territory, but to make it develops in a more prosperous or in other words more competitive way. Keeping in mind the understanding of leading researchers, and particularly the expert in the field of competitiveness Michael Porter, over the years a significant transition was observed regarding the policies for territorial development. The transition involves a shift from directly distributing resources, mainly financial, through programs or direct subsidies to regions in need with less favorable indicators compared to other regions, to implementing region-specific measures aimed at supporting and increasing the productivity of local businesses.

This transition also aims to promote private investments and innovations in the designated regions.

Porter (2004) and other researchers see productivity and innovations as the heart of the path of regions toward raising their competitiveness. Based on that understanding, the definition of regional competitiveness by the EU Commission is "the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work." (Dijkstra et al., 2023). Michael Porter explains it in a way that "Competitiveness depends on the productivity[1] with which a location uses its human, capital, and natural resources." (Porter, 2008). The economic and social effects stalked by raising the productivity lead towards a raise in the standard of living.

The difficulty to design regional policies for development and to find means to raise regions' competitiveness comes from their complexity. The complexity results from the variety of elements-drivers of local development (people, enterprises, natural resources, infrastructure, etc.) and complex interrelations among them, as well as the industrial specialization of the region. The challenge to research the competitiveness of rural regions comes from the "belief that rural regions are home to an inherently less favorable composition of economic activity than metropolitan regions." (Porter et al, 2004, p. 19). The common belief is that the main two sectors in rural regions are agriculture and traditional labor extensive manufacturing that in the age of digitalization hardly could be a driver of prosperity. Current empirical research deals with the process of digitalization. Toma based on empirical research concludes "digital manufacturers are relatively often found in rural areas" (2023, p. 219) and also that "Germany's rural regions are home to a relatively large share of small "Mittelstand" firms for which the use of complex digital manufacturing technologies (Industry 4.0) is an important factor influencing innovation and competitiveness." (Toma, 2023, p. 220). Other researchers raise the issue about knowledge-intensive business services (KIBS) and their role in rural areas (Hlaváček et al, 2023; Doloreux et al, 2023). Therefore, the traditional perception for rural regions' industrial structure is changing.

Already in 2005, OECD researchers emphasize that regional competitiveness policies represent a challenge for the local and national governments and their success depends on "effective integration of sectoral policies such as R&D and education" (OECD, 2005, p. 8). What comes as a result is the heterogeneity of economic performance among rural regions (Porter et al. 2004). Thompson & Ward

[1] Productivity is measured by the value of goods and services produced per unit of labor, capital, and the natural resources employed and productivity, contrary to popular usage, is more than just efficiency. It depends on the value of the products or services that a region's firms can produce, as measured by the prices they can command, not just their efficiency of producing standard items. (Porter et al., 2004, p. 6)

(2005) argue that the prevailing perception among national and regional policy makers is that rural areas are merely passive recipients of urban-oriented development.

In 2004, Porter et al. talked about “no truly comprehensive assessment of the performance of rural regions in the literature” (Porter et al., 2004, p. 7). OECD researchers claim that the “concept of competitiveness applied to rural regions is still relatively new, but is having an important influence on policymaking” (OECD, 2005, p. 11). Further, the strong attention and the extension of the concept about competitive development on regional level resulted in a change in the regional policy (OECD, 2005, p. 20). The regional policy evolved replacing predominating top-down approach, direct financial interventions into a “broader family of policies designed to improve regional competitiveness” (OECD, 2005, p. 22; Porter, 2008). The regional policy transition involves a development strategy that influences both direct and indirect factors impacting the performance of local firms. It primarily focuses on endogenous factors, with less emphasis on endogenous investments and transfers, while prioritizing opportunities over disadvantages and granting greater power to local stakeholders.

What was said about the existing ambiguity for competitiveness as a notion is valid also for the notion rurality. The fact is that a variety of classification criteria and typologies exist due to the lack of a clear concept (Center for Regional Development, 2007; Isserman, 2005; Waldorf, 2006). Porter et al. concluded that lower density of population is a real problem for rural regions and that distinguishes them most from the metropolitan regions, but “it does not suggest the need for a fundamentally different economic development approach” (Porter et al, 2004, p. 5) towards rural regions. The last idea supports the thinking that the approaches and methods to measure regional competitiveness are appropriate and applicable also for the rural level. And, further, they say “Examining economic development in rural regions using the same analytical lens as applied to economic development generally, will hopefully shed new light on their prospects and appropriate policy.” (Porter et al, 2004, p. 5).

Approaches and models to assess regional competitiveness

The assessment of competitiveness is an important issue on a country, EU level, and worldwide level. Within government circles, there is growing interest in the regional foundations of national competitiveness and the development of new forms of regional policy interventions to help improve the competitiveness of each region and major city, and hence the national economy as a whole.

Most often, aggregate macroeconomic indicators are used to assess competetiveness. The same approach is applied also at regional level. The focus of the measurement of competitiveness with that approach is on the output (results) of the system. That logic is followed by competitive indexes produced by worldwide acknowledged organizations as World Economic Forum (WEF), International institute for management development (IMD), Food and Agriculture Organization (FAO), Organization for Economic Co-operation and Development (OECD), European Commission (EC), and the World Bank. Papers of Rizzi et al. (2015), Dijkstra et al. (2011), Huovari et al. (2001), Mikuš et al. (2012), CORE (Competitiveness Analysis of Regional Entities) for the analysis and evaluation of competitiveness of municipalities in Mexico developed by Fernandez et al (2013), Bukhtiyarova et al. (2020), Doitchinova & Stanimirova (2022), Peneva & Bankova (2024) apply that approach to measure regional competitiveness as well. Bowen (2012) describes a methodology for estimating suppressed values in a series of regional-level business models from the US Census using the resulting enhanced dataset in shift-share analyses (SSA) and then providing these analyses and some potential explanatory variables for web mapping. The end result is an online tool that can be useful in analyzing regional competitiveness, especially in rural areas.

Another approach to investigate competitiveness is via a comprehensive (mostly primarily descriptive) analysis to identify the key drivers of regional development, productivity and economic growth. In another way, that is the approach that focuses on the factors responsible for the rise or the decline of competitiveness. Examples of methods based on that approach are the Diamond model of Michael Porter (Porter, 1990), and the model of drivers of regional productivity (Kitson et al., 2004, p. 995).

To the first type of approach towards measuring and discussing regional competitiveness, based on the outcomes for the system represented, we may outline the following:

(1) Index for Measuring Regional Variation and Competitiveness (Huovari et al., 2001) developed by a group of Finnish researchers, which is based on 4 sub-indices, each of which has an equal weight in the final one.

(2) Regional competitiveness index (RCI) that adapts the framework developed by WEF for the GCI (global competitiveness index) and extends it to the regional context in the EU, with the aim of capturing the underlying factors that support a region's long-term economic development (Dijkstra et al, 2023). The newest version of the index, calculated for the first time for 2010, is RCI 2.0 and suppose some changes in the methodology. The RCI is calculated for the territories of NUTS 2 level. In methodological terms, RCI comprises three sub-indices – basic, efficiency and innovation, and 11 pillars that refer to different aspects of competitiveness on that level. Basic sub-index covers the basic conditions presented by 5 pillars: institutions, macroeconomic stability, infrastructure, health and basic education. The second sub-index Efficiency assess the achievements of the region in three aspect specified as 3 pillars: higher education, training and life-long learning; labor market efficiency; market size. The innovation sub-index also includes three pillars: technological readiness;

business sophistication innovation. What the authors of the index themselves comment is that a "composite indicator of this complexity is always subject to small modifications and adjustments" (Dijkstra et al, 2023, p. 8).

(3) Data envelopment analysis (DEA) method is used to measure regional efficiency and subsequently to measure regional competitive potential. DEA was developed by Charnes, Cooper & Rhodes (1978) as a non-parametric method to identify production frontiers. Regarding the usage on regional level, it allows to measure the relative productivity of a sector of the regional economy compared to the same sector in another region in order to establish its regional competitiveness: 1) defining and selecting indicators (most commonly GDP, employment by sector, investment, economic activity of business units, education spending, IT infrastructure density, etc.) that are consistent with those used in the development of the index; 2) defining the input and output variables to be used to measure relative efficiency by region; 3) applying the analysis models with data coverage and interpreting the results. In that way, the DEA method is accepted as an appropriate method to determine each region's competitive/non-competitive position. The application of the method is based on the hypothesis that the performance of regions can be considered as a source of regional competitiveness/competitive potential. Charles and Zegarra (2014) apply the method to measure regional competitiveness and outline methodlogical and practical advantages attributed to DEA to assess the competitiveness on that level. The authors present a structure of regional competitiveness based on five pillars – economy, firms, government, infrastructure, and human capital. Charles and Zegarra (2014) state that their study overcomes several limitations postulated in the scientific literature in the past. Thus, the development of a robust super-efficient model to overcome the DEA ranking constraint may be useful in terms of refining the assessment of regional competitiveness.

(4) Comparatively new is the research of Kovshov et al. (2024). It develops a new approach towards interpreting the notion of "international, regional competetiveness of rural territories" and assesses the position of rural territories of the region in the domestic and external (international) markets through a comparative assessment of indicators that measure production and export potential, competitive advantages, and economic, social and environmental factors.

The second approach to regional competitiveness involves examining the factors that support competitiveness.

As said before, the "Diamond model of competitive advantages" developed by Michael Porter represent that approach. According to Porter, regions compete in providing the most productive environment (Porter, 1990). Four are the main aspects according to that model. The first one refers to Firm strategy, structure and rivalry. On a regional level, that factor translates into local policies or specific regulations that could affect in a positive way the investments and innovation activity of firms located on the territory of the region. The second factor is the Demand condition. Specific characteristics that lay behind that determinant are factors related to local population and business entities in the role of customers. That determinant is beneficial when the customers are knowledgeable, competent and demanding. The third group of factors is named Related and supporting industries. That are local suppliers and the determinant signifies about the level of clusterization. The fourth main determinant in the model is Factor conditions. These are human resources, raw materials, different types of infrastructure, and educational institutions. One of the criticisms of the model is its inflexibility (OECD 2005). Following the interrelations among the four main determinants in the Diamond model, improvement in competitiveness of some firms in some sectors will influence other related firms and business activities. And that will not be just the firms around, in localization mean, but also in other geographical places. In that way we observe effects that are meaningful from point of view of regions and their competitiveness. Talking about competitiveness, location matter a lot is what Porter gives argument. The main proof based on his research is that firms acquire their competitive advantage because of the fact they have chosen the correct location. Right location may mean raw materials, skilled labor, proximity to markets, etc. And, “Skilled labor and investment gravitate away from “uncompetitive” regions towards more competitive ones” (OECD, 2005, p. 20). Two notions are important in that regard: (1) Structural competitiveness specifies the capacity of region to support and attract economic activity; (2) Territorial capital represents the attributes that a region possesses and could support or not its competitiveness. Further, Kitson et al. (2014) present another way to assess the regional competitiveness that implements the logic of that second approach based on drivers for regional development. They present a model of the base of regional competitive advantages represented by different types of capital: productive capital, human capital, social-institutional capital, cultural capital, infrastructural capital and knowledge/creative capital. They say “… the definition and explanation of regional competitive advantage need to reach well beyond concerned with “hard” productivity to consider several other – and softer – dimensions of the regional or urban socio – economy.” (Kitson et al, 2014, p. 994).

Conclusion and discussion on the appropriateness of methods used on regional level to measure rural competitiveness

Over the years different researchers questioned to what extent the frameworks describing a firm's ability to compete, grow and be profitable can be applied to countries or regions (Martin et al., 2006). The implicit analogy between firms and nations has been widely criticized (Krugman, 1994). Regarding that, we find in the literature an important clarification by Kitson et al. (2004, p. 997) “the notion of regional competitiveness has meaning and value, it is much more complex and richer concept…that focuses more on the determinants and dynamics of a region's long-run prosperity than on more restrictive notions of competing over shares of markets and resources."

Regarding the RCI, even the third sub-index' pillars, to some extent, are relevant to rural regions, considering the technological advancements and digitalization in both most widely represented industries – agriculture and basic manufacturing (see also Toma, 2023). The most significant difficulty and limitation would be regarding the data to feed the calculation of RCI for rural regions. That problem is discussed as a first step of the methodology for RCI 2.0 (Dijkstra et al, 2023). Another problem in conducting comparative analysis using RCI could be administrative reforms on local level. Simultaneously, DEA analysis offers opportunities to reflect the complex nature of processes, multiple factors at the input and output of a system and the variety of relationships and dependencies between them also on a rural level.

Therefore, considering the peculiarities of the given rural region all of the methods used to assess the regional competitiveness could be applied with some adjustment. After comparing the methods representing both outcome-based and driver-based approaches, we can conclude that using a combination of methods from both approaches would be a more effective way to assess the competitiveness of rural regions.

The arguments are as follows: first approach integrates competitiveness logic to be evaluated through indicators representing the output of the rural region, providing insight into the current state of the system. Another approach includes the analysis of development drivers, considering qualitative aspects and the potential for future development in the region. The outcomes of the still potential opportunities for development would be visible and could be reported in the future. In other words, the co-use of methods deals simultaneously with the static and dynamic nature of competitiveness that corresponds to the systems' approach logic.

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AI (Grammarly) was used to correct grammar, spelling, and punctuation issues and shorten sentences.

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DEMOGRAPHIC PROCESSES AND THEIR IMPACT ON RURAL AREAS: THE EXAMPLE OF THE SOUTHWEST AND SOUTH-CENTRAL REGIONS

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Abstract
In a context of rapidly declining populations and deteriorating demographic characteristics, research on the development of implications and causes of spatial disparities is expanding to encompass more and more factors and characteristics of regions. The aim of this paper is to assess the demographic trends in the Southwest and South-Central statistical regions and their implications for rural development. The subject of the study are the territories of the two most populated regions in Bulgaria, which include diverse rural areas – mostly mountainous and semi-mountainous with natural resources and potential for economic diversification. They include the two largest cities with characteristics of agglomeration areas, but also the municipalities with the lowest population density. The object of the study are the demographic processes and characteristics and their impact on rural development. A complex methodological approach is applied, which uses and combines quantitative and qualitative methods and thus assesses the impact of the recorded demographic processes and changes. The study was carried out on the basis of information from the population censuses conducted in 2011 and 2021, current information of the National Statistical Institute and expert assessment of 57 surveyed specialists in the field of regional development, municipal administration and agrarian economy. The results are analyzed for the nine districts with rural areas in the Southwest and South-Central regions (NUTS3 level). The first part of the report presents and evaluates the changes in the number of the population, as well as some basic characteristics such as educational structure, coefficients of demographic dependence, economic activity, etc. A number of negative trends in the ongoing demographic processes have been assessed, which are most pronounced in the remote and border areas of the territory. In the second part of the report, the expert assessments of the respondents, recruited through a survey conducted in the period September 2023 – April 2024, are presented. They are divided into several areas: assessment of the educational and health infrastructures; assessment of the effects of educational and age structures on the development of rural areas; the impact of migration processes in direction to cities and abroad, etc. A four-point Likert scale was used. The prevailing opinion of the experts is that the level of income, the deteriorating educational and health infrastructures are among the main reasons for the negative demographic processes. They adversely affect entrepreneurial activity, the administrative capacity of local authorities and, in general, the quality of the workforce in rural areas. At the same time, the impacts are more pronounced in remote and border sparsely populated rural areas in the districts of Kardzhali, Smolyan, Kyustendil, Pernik and Blagoevgrad.
Keywords: demographic processes, economic activity, rural territories
JEL code: J11, J43

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Introduction

The population of Bulgaria is decreasing. In the 21st century, for the twenty-year period (2001 – 2021), the population decreased by 21.6%. The rate of decline is significantly higher in rural areas of the country and is associated with low incomes, unemployment and poverty in these areas. Along with the reduction of the population and its density, there is also a deterioration of a number of qualitative indicators such as age structure, demographic replacement rates, ratios between the elderly population and the working age population, economic activity, etc. (Bardarov, Ilieva, 2020; Tsekov, 2021; Doitchinova, Wrzochalska, 2022; Ilieva, Bardarov, 2021; Doitchinova, Lazarova, 2023).

Some authors (Labianca M.; Valverde, 2019) define the demographic aging of rural areas as one of the most serious obstacles to generating development in rural areas. The deepening social decapitalization and decapitalization of the population "increasingly distances these spaces from their recovery and significantly hinders the implementation and effectiveness of rural development policies" (Leco et al., 2017, p. 97). An essential place in these processes is the loss of certain groups – most often – young, highly educated or economically active. In practice, this puts stress not only on economic prosperity, but also on the potential for the development of social and cultural capital. In the longer term, it is logical to expect a limitation of the community's capacity to act and recover (Bock, 2016, p. 557).

Some researchers (Wood, 2008; Carr, Kefalas, 2009) come to understand the emergence of a cyclical pattern in which the local economy and depopulation coexist and reinforce each other. Moreover, in cases of specialization of the region in the agrarian sector, the loss of population is accelerated and a connection is established between the reduction of the number of small farms and the reduction of the population in rural areas (Johnson, Lichter, 2019). On the other hand, different production specialization in the agrarian sector also affects the speed and characteristics of demographic processes in rural areas. (Doichinova, Miteva, 2020; Doichinova, Stoyanova, 2020).

The change in population numbers and characteristics is influenced by a wide range of diverse factors, but a weakness of most studies is that they focus only on one or a few factors and their impact (Chi, G., 2010). Economist researchers focus on: the characteristics of human capital (Wrzochalska, 2015) and its potential for sustainable development (Yordanova et al., 2024); of the educational structure of the population in rural areas (Wrzochalska, Łaba, 2022); the role of demographic processes in the development of rural areas (Mitova, 2018; Sugareva, Murgova, 2021; Doitchinova, Wrzochalska, 2022), etc. Other authors associate the uneven distribution of depopulation (Ilieva, Bardarov, 2021) with the distance from the main centers of employment, with an aging population, low fertility and low immigration (Johnson, Lichter, 2019). Last but not least, demographic processes are associated with the state of health and educational structures, the quality of life in rural areas, etc. (Nikolova et al., 2018; Lazarova et al., 2023).

The results of a number of studies conclude that the development of rural areas depends on the capacity of rural communities and their ability to adapt to external changes. And among the main determinants of this capacity is human capital with its characteristics.

In this context, the purpose of the article is to assess trends in the demographic development of the Southwest and South-Central Statistical Areas and their implications for rural development.

Methodological framework

The object of research are the two most populated regions of the country – the South-Central Region (1,304,639 thousand people) and the Southwest Region (2,019,167 thousand people), and the subject – demographic processes and characteristics and their impact on rural areas. The used methodological approach combines quantitative and qualitative methods, namely statistical processing of information and expert assessment of specialists in the field of regional development of rural areas recruited through a survey. The used information is for the period 2011–2022 for the study of demographic processes according to data from the National Statistical Institute (NSI), the Population and Housing Census in the Republic of Bulgaria in 2021 and 2011 and other databases.

The survey was conducted in September 2023 – April 2024 throughout the country. For the studied regions, 57 experts participated in it – 28 from the South-Central region and 29 from the Southwest region. The majority of respondents are experts and managers in municipalities, in the regional offices of the National Agricultural Advisory Service, from the teams of local initiative groups, etc.

With the use of a four-point Likert scale, the impact of demographic processes on the administrative capacity of the municipal administration, entrepreneurial activity, the quality of the workforce, as well as the state of the current health and educational structures, the current level of pay and their impact on demographic processes is assessed.

Analysis of demographic processes

In the period between the two last population censuses (2011 and 2021), the number of populations in all surveyed districts in both surveyed regions decreased – within limits of 6.8% in Sofia District to 22.0% in Kyustendil. The population of the villages reduced much faster, from 11.6% in Sofia region to 35.8% in Pernik (Table 1).

Age dependency ratio is between 49.2 (Sofia region) and 66.3% (Kyustendil region). In the same areas, the lowest and maximum values of the ratio between the elderly population (over 65 years) and the population of working age are 25.7% and 46.2%, respectively within the South-Central Region only.

Table 1. Rural areas at the NUTS 3 level by province in 2021

	The rate of natural increase (2021)			Age dependency ratio (2021)		Economic activity (2023)
	Total (‰)	City (‰)	Village (‰)	Young and elderly to working age population (%)	Elderly to working age population (%)	
Blagoevgrad	–10.6	–8.5	–13.9	53.7	31.0	74.7
Kyustendil	–22.0	–17.2	–33.2	66.3	46.2	74.7
Pernik	–21.2	–17.1	–35.8	60.7	40.5	77.7
Sofia Province	–6.8	–6.5	–11.6	48.2	25.7	73.5
Kardjali	–11.1	–7.4	–13.5	56.0	34.1	67.7
Pazardjik	–14.0	–12.8	–16.2	57.0	33.2	72.5
Plovdiv	–11.3	–9.3	–17.0	55.6	32.2	72.8
Smolyan	–16.8	–12.2	–22.8	59.8	41.6	75.1
Haskovo	–15.5	–12.1	–24.3	60.9	37.5	67.8
For the country	–13.2	–10.5	–20.2	56.7	34.0	
The lowest value of the indicator	–6.8	–6.5	–11.6	48.2	25.7	67.7
Highest values of the indicator	–22.0	–17.2	–35.8	66.3	46.2	77.7

Source: NSI, 2022 and own calculations.

Another important indicator is the economic activity of the population, which according to a recent study (Doitchinova, Lazarova, 2024) is increasing in all areas. In 7 of the studied districts, an indicator above 70% was formed, and in only two of the districts (Kardzhali and Haskovo) the formed indicators were below 70% (67.8 and 67.7%, respectively). The highest economic activity is in Pernik district, being the difference with the lowest value of the indicator (Haskovo) 10 points.

The data from the two censuses show that there have been significant changes in the relative share of the highly educated population (Figure 1). Under the conditions of a reduced absolute number of inhabitants, in all regions the indicator has increased within limits of 3.75 points (Sofia region) to about 6% (Haskovo and Pazardzhik). In 2021, the highest relative share of the population with higher education is in Kyustendil (18.5%), Blagoevgrad (15.42%) and Pazardzhik (15.24%) districts. The presence of highly educated people is the least in the districts of Kardzhali (9.49%) and Sofia (10.75%). The formed difference between the maximum and minimum values is 9 points.

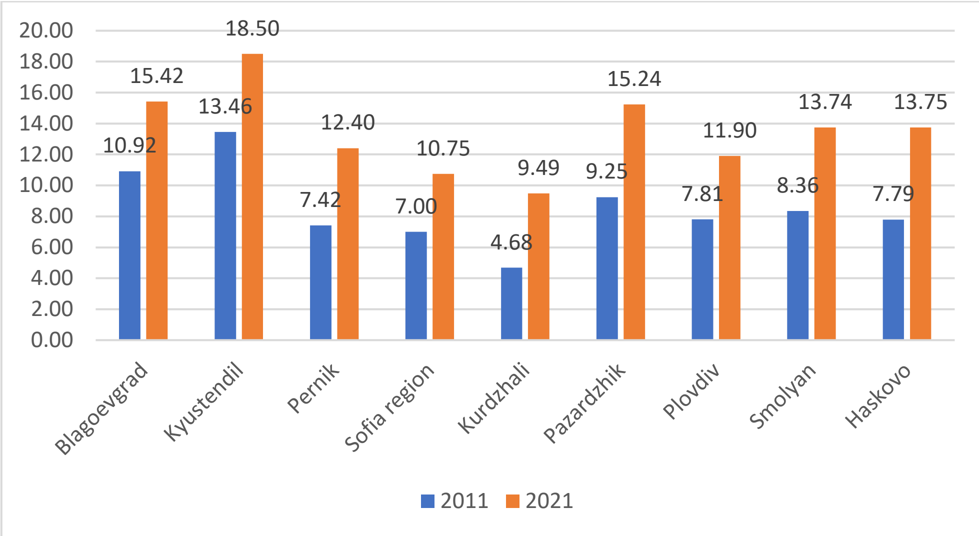

Figure 1. Relative share of the population with higher education in South Central and South-Western regions in 2011 and 2021

Source: NSI, 2024

Evidence for the improved educational structure is the decrease of population with primary and lower education (Figure 2). If in 2011 this population ranged from 39.64% (Kyustendil region) to 52.64% (Plovdiv region), in 2021 it decreased from 24.31% (Haskovo region) to 37.37% (Plovdiv region).

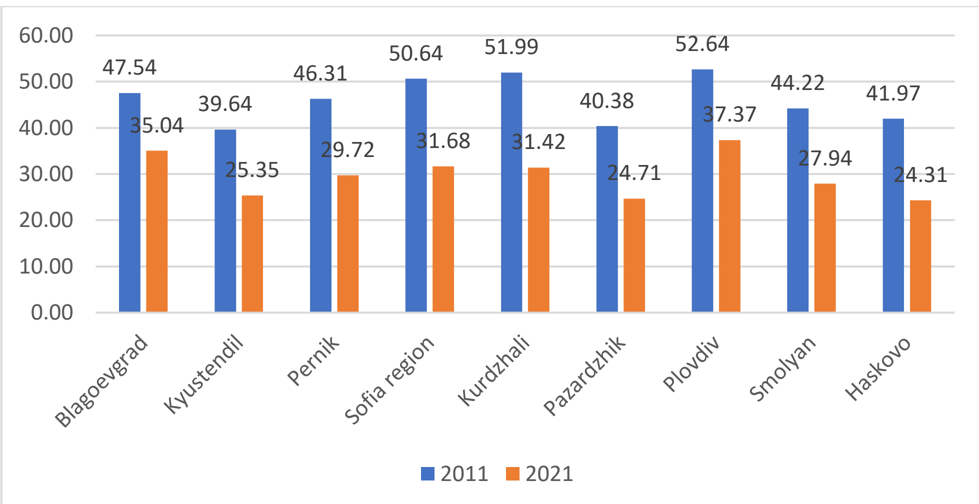

Figure 2. Relative share of the population with primary and lower education in South Central and Southwest regions in 2011 and 2021

Source: NSI, 2024

Expert assessment of the impact of demographic processes on the development of rural areas

The expert assessment of the respondents for the studied areas show the highest values for the ongoing migration processes in the areas of Kyustendil, Plovdiv and Smolyan, followed by Kardzhali. The highest scores are in the range of 3.0 – 3.38 in five of the areas (Figure 3).

The lowest rating of the respondents was in the Pazardzhik district – 2.0.

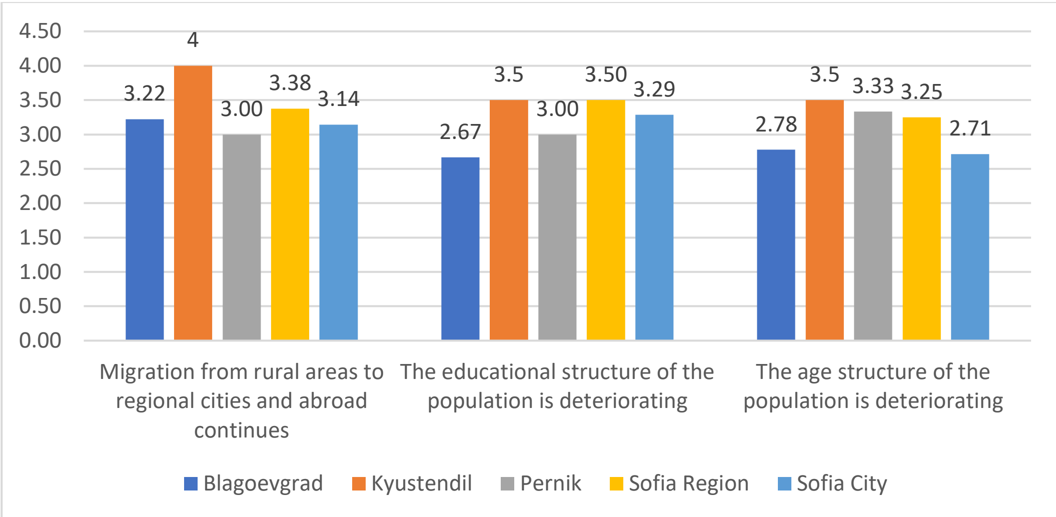

Figure 3. Expert assessments of the migration processes and the deteriorated age and educational structures in the Southwest region

Source: own study

The opinion about the deteriorating educational and qualification levels of the population is widely supported by the respondents in all areas. The highest scores are in Kyustendil and Pazardzhik regions (Figure 4). The assessment of the deteriorated age structure in Kyustendil received the maximum possible assessment.

The deteriorating educational structure was rated the lowest in the districts of Kardzhali, Blagoevgrad and Smolyan – 2.6, 2.67 and 2.83, respectively. In practice, this means that in these areas it is not assessed as a leading factor for the current state.

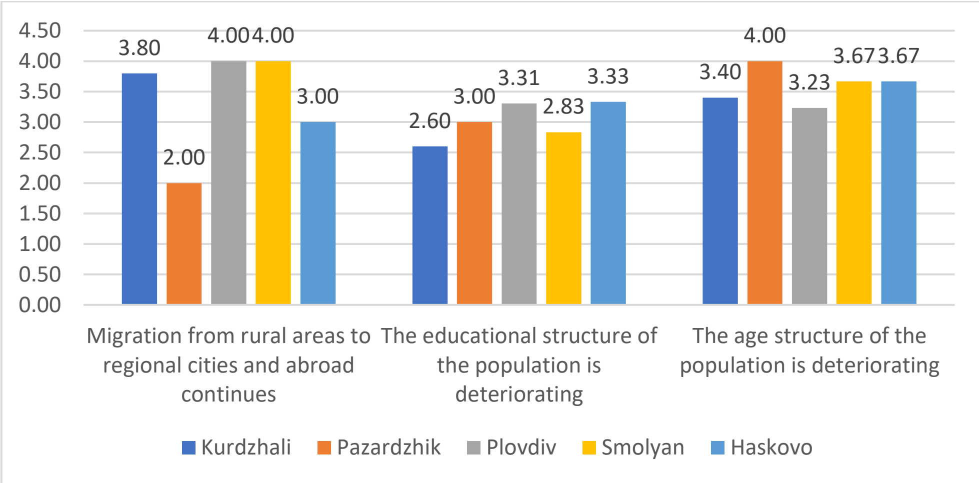

Figure 4. Expert assessments of migration processes and deteriorated age and educational structures in the South-Central Region

Source: own study

Together with the current age and educational structures, the degree of development of the educational and health infrastructures in the rural areas is also assessed. According to the experts, education is poorly developed in Kyustendil and Sofia regions, and health care in Kyustendil, Pernishka and Sofia regions (Figure 5). The adverse impact of low incomes on demographic processes has the highest support from respondents in Kyustendil and Pernik districts, followed by Blagoevgrad.

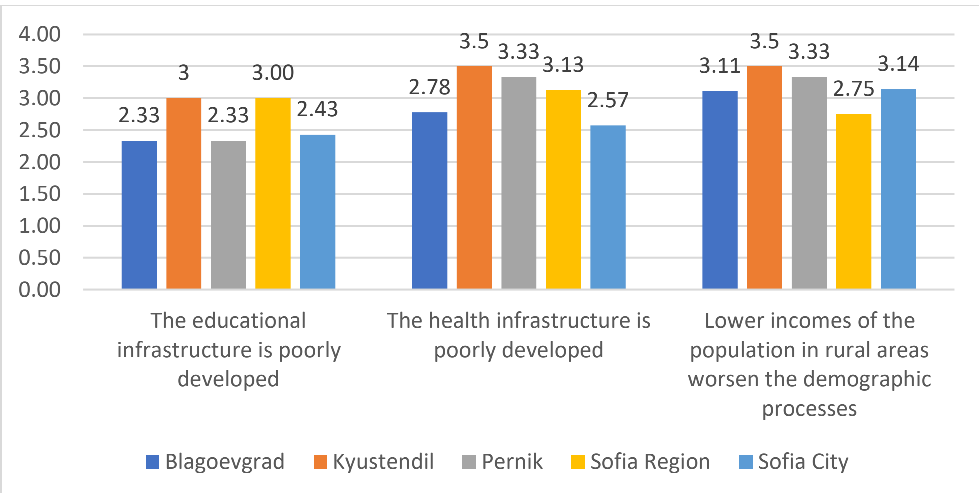

Figure 5. Expert assessments of educational and health infrastructures and income impact of demographic processes in the Southwest region

Source: own study

In the districts of the South-Central Region, Blagoevgrad and Sofia districts are in first place according to the assessment of underdeveloped educational and health infrastructures (Figure 6).

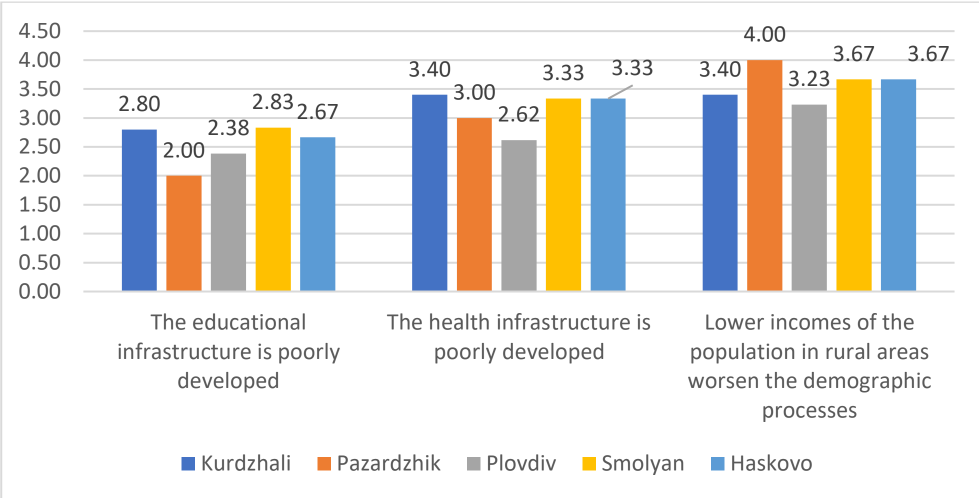

Figure 6. Expert assessments of educational and health infrastructure and income impact of demographic processes in the South-Central Region

Source: own study

The experts' assessments of the impacts of the demographic processes in rural areas are shown in Figure 7 and Figure 8. The assessment of the impact of these processes on the administrative capacity of the municipal administration in the rural areas of Kardzhaly (3,4) and Smolyan regions (3,17) is the highest in the South-Central region and those in Kyustendil (3.0) and Blagoevgrad regions (2.78) are the highest on Southwest region. In practice, these are more remote and border areas.
Demographic processes lead to a decrease in entrepreneurial activity, especially in the districts of Smolyan and Haskovo (3.5 and 3.33 respectively) and in Kyustendil and Blagoevgrad (3.5 and 2.78).
Last but not least, the ongoing demographic processes are the cause of a decrease in the quality of the workforce. They are rated highest in Pazardzhik and Kardzhali districts (respectively 4.0 and 3.6) of the South-Central region. In the Southwest region, the statement received the highest support in Kyustendil and Pernik (in both the assessment is 3.0).

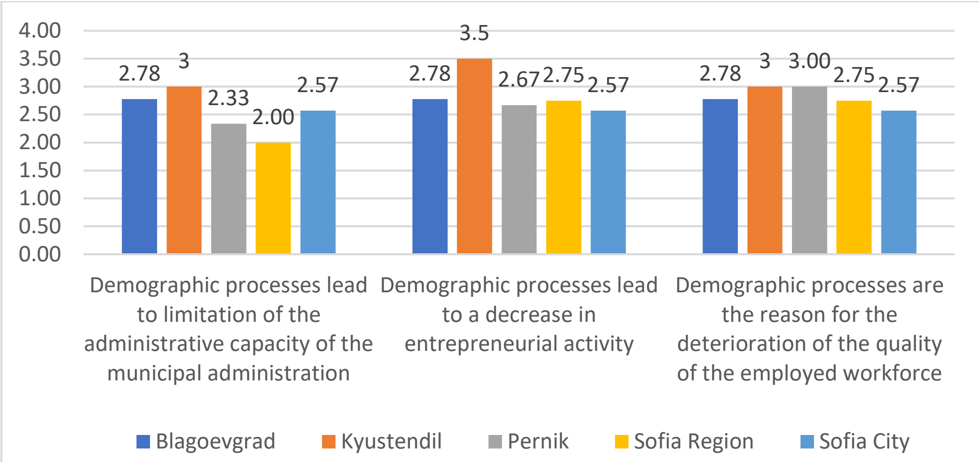

Figure 7. Expert assessments of the impacts of demographic processes on administrative capacity, entrepreneurial activity and the quality of the labor force in the Southwest region

Source: own study

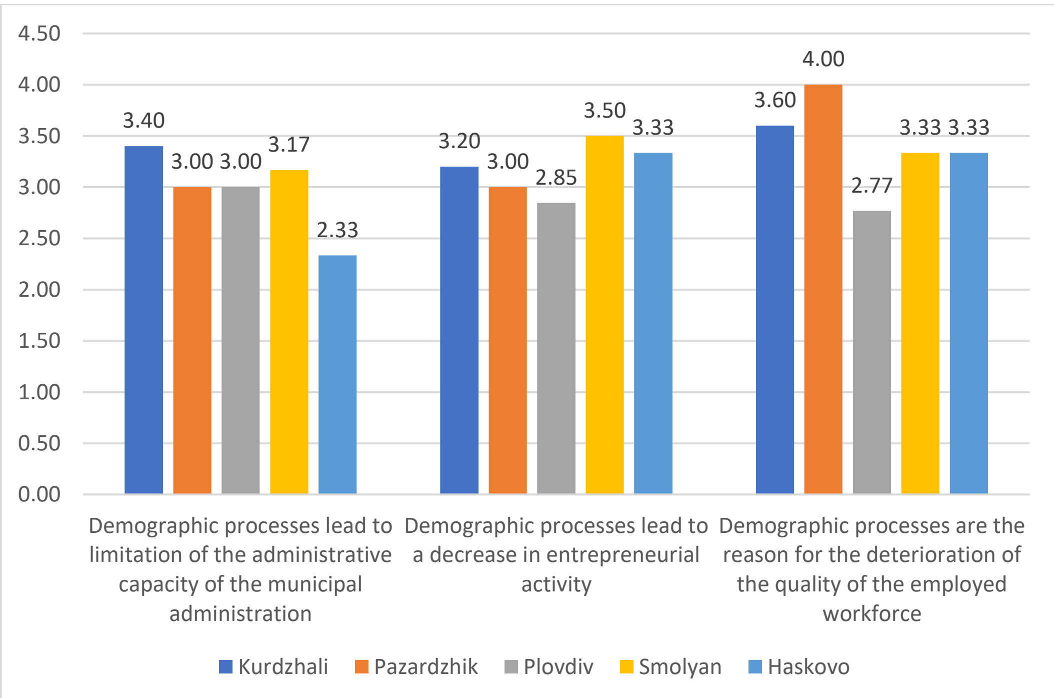

Figure 8. Expert assessments of the impacts of demographic processes on administrative capacity, entrepreneurial activity and labor force quality in South Central Region

Source: own study

Conclusion

Based on the analysis, a number of conclusions can be drawn, the most important of which are:

- ✓ The population in rural areas, including in the settlements of the village type, decreases faster compared to the data for the country as a whole and for the territories with settlements over 15 thousand inhabitants;
- ✓ The results of the population censuses of 2011 and 2021 show a deterioration of the age structure and the ratio between the elderly and working-age population. In some areas, the indicators reach values that not only threaten the population's reproduction opportunities, but also negatively affect administrative capacity, local entrepreneurship, etc.
- ✓ In the conditions of population reduction, an improvement of the educational structure was observed, but it was not confirmed in the opinions of the surveyed experts;
- ✓ The state of the educational and health infrastructure was negatively assessed in all regions;
- ✓ Among expert assessments of the impacts of demographic processes, negative assessments prevail.
- ✓ In terms of age and educational structures, the highest negative scores are for rural areas, which are located in territories that are far from large urban centers and border areas. In these areas, unemployment is high and entrepreneurial activity is extremely low.

Negative demographic processes and unfavorable qualitative characteristics of the population in rural areas impair the capacity of local authorities and communities to implement the rural development policy based on the “bottom-up” approach. The latter complicates the creation of local development strategies and their financing. On the one hand, the number of active farmers and rural residents with entrepreneurial ideas to be included in development strategies is limited. On the other hand, the several-year period from the development of the local development strategy to the implementation of the specific project for farm modernization, diversification of economic activity or development of non-farm business becomes a reason for hesitation of potential beneficiaries or for refusal to implement the project. All this leads to difficulties in all stages of the implementation of the “Community-Led Local Development” approach.

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FINANCIAL AND CREDIT SUPPORT OF SUSTAINABLE DEVELOPMENT OF AGRICULTURE IN UKRAINE: PROBLEMS AND WAYS TO SOLVE THEM

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Abstract
The paper studies financial and credit support mechanisms necessary for sustainable development of agriculture in Ukraine, with a focus on addressing the challenges faced by small and medium-sized agricultural producers. The study emphasizes the unique economic characteristics of agricultural sector, which make it highly dependent on external financing due to factors such as price volatility, climatic variability and the high cost of production inputs. Given these challenges, the aim of the article is to analyze the institutional and legal framework of financial and credit systems in Ukraine and to propose approaches for enhancing access to credit for small and medium-sized farms, drawing on successful experience of developed countries.
The authors hypothesize that the financial sustainability and growth of small and medium-sized agricultural producers in Ukraine can be significantly improved through the establishment of cooperative financial institutions and targeted state support programs.
The study uses a combination of methods, including monographic analysis to explore the role of state support of agriculture in both Ukraine and developed countries, comparative analysis to highlight differences in credit service structures between Ukraine and countries such as United States and European Union members and empirical methods to assess social and environmental benefits of establishing a specialized credit system for agriculture. The study also utilizes abstract-logical methods to synthesize findings and formulate recommendations for the development of Ukraine's financial and credit institutions.
The results of the study reveal significant gaps in Ukraine's current financial infrastructure of agriculture, particularly the lack of specialized financial institutions capable to meet the needs of small and medium-sized farms. An analysis of the practice of commercial bank lending in Ukraine shows that these institutions are interested in working only with those who use 500 or more hectares of agricultural land. The article identifies cooperative banking systems in countries like France, the United States and Poland as models that could be adapted for Ukraine.
The study concludes that the establishment of cooperative financial institutions, supported by legislative and regulatory reforms, is essential for fostering the sustainable development of agriculture in

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Ukraine. Additionally, state support is critical to ensure the financial viability of small and medium-sized farms, which contribute significantly to agricultural output but are often excluded from traditional credit markets. Authors recommend the introduction of targeted state programs, the restructuring of existing financial institutions and the creation of legal frameworks that would enable the formation of cooperative banks and credit unions tailored to the agricultural sector. Such measures would improve credit access, enhance the profitability of agricultural enterprises and promote rural economic development.
Keywords: agriculture, small and medium sized agribusiness, cooperative banks, institutional and legal support, state support.
JEL Codes: Q 130

Introduction

Agriculture has different features from other industries, which cause the inability of the industry to self-accumulation and expanded reproduction without state support. In particular:

- in agriculture, for the same profit is needed the more amount of investment as for other industries. At the same time, world statistics confirm the historical difference between the current disparity in agricultural prices and related industries, which has a negative impact on the income of agricultural producers;
- crop yields and accordingly the supply of animal feed by 44 – 55% depend on changing climatic conditions, which causes instability of prices for agricultural products and income from its sale;
- price elasticity of demand for agricultural products is quite low and fluctuates, as a rule, up to 1% (in developed countries, the elasticity coefficient ranges from 0.20 to 0.25), which affects the decline in prices and, consequently, income (McConnell, 2001);
- agriculture is more dependent on lending compared to other industries due to the specific features of reproduction in agricultural production: dependence on natural and climatic factors makes big influence on current production, which requires significant amounts of loans with different maturities; the presence of a seasonal gap between the investment and their income from the sale of finished products necessitates extended repayment terms of short-term loans; the need to have a significant stock of raw materials in circulation slows down the rate of turnover and requires lending to working capital (Nepochatenko, 2007). This is a pattern for all countries, regardless of their level of economic development. In the structure of agricultural capital, the share of financing of agricultural producers through borrowed funds is, for example, in the UK, Germany, Sweden – 50%, in the US – 70% of the total cost of agricultural production.

Under such conditions, the accumulation of equity for the purchase of such an expensive means of production as agricultural land is problematic, especially for small and medium-sized farms, which requires the use of significant amounts of borrowed capital. At the same time, access to commercial banks is limited for them due to

high interest rates and unbearable conditions of access to them. In addition, commercial banks have little interest in lending of agricultural producers, especially small and medium-sized ones, due to the high level of production risk and low liquidity of mortgage. Solving the problem requires the state support.
State policy to support the financial capacity of agricultural producers is carried out in two directions: the first is to create favorable conditions for the acquisition of agricultural producers, especially small and medium, which make up the vast majority of world agriculture, necessary and affordable loans; the second connected with state support for stable profitable activities of these farms at a level that ensures timely repayment of loans and protection of farmers from loss of mortgaged land and other assets, the recovery of which requires a long period and significant funds and financing their further production activities.

Theoretical basis

These problems are not out of the attention of Ukrainian scientists. The theoretical foundations of the formation of cooperative financial and credit institutions, specializing in servicing agricultural goods and workers, associated with works of Panteleimonenko (Panteleymonenko, 2006), Khodachevich (Khodachevich, 2016).
Foreign experience of credit cooperation in agricultural sector is covered in their research Nedilska (Nedilska, 2018), Pozhar (Pozhar, 2013), Sember (Sember, 2017). Financial support for the profitability of agriculture as an objectively determined method is covered in works of Onegina (Onegina, 2007), Mogilny (Mogilny, 2002) and others.
In recognizing the contributions of Ukrainian scientists, it is essential to undertake a more constructive analysis of the role and significance of specialized financial and credit institutions in the development of agricultural sector, as well as the factors impeding their progress in Ukraine.

Research material and methodology

The purpose of this study is to propose solutions to the challenges hindering the establishment of specialized financial institutions in Ukraine's agricultural sector by conducting a comparative analysis of both Ukrainian and international experiences in the creation and operation of such institutions aimed at supporting the sustainable development of agriculture.
The following methods were used in the research process: monographic (analysis of the directions and approaches of state support in Ukraine and in developed countries); comparative analysis (features of financial and credit services for agricultural producers in Ukraine and foreign practice: USA and EU countries are determined); empirical (on a comprehensive assessment of social and environmental advantages of the creation of system of financial and credit services for agricultural producers);

abstract-logical (generalization and formulation of the main conclusions and proposals based on the results of the study).

Results

Financial and credit services of agricultural producers in foreign practice are characterized by institutional features compared to other industries. These functions in agriculture are performed by specialized institutions, which include both banking and non-banking institutions.

In EU countries, lending is usually provided through a system of cooperative banks. In France it is the network of Credit Agricole cooperative banks, in Netherlands it is Rabobank, in Romania it is Creditcoopbank, in Spain it is Cooperative de Credito and in Germany it is Deutsche Genosenshaftsbank. Poland's rural cooperative credit system includes 596 cooperative banks with 3,300 local branches, which provide 80% of the needs of their member farmers for loans. The co-operative system of long-term lending of India, whose members are 67% of farmers (880 thousand farms), includes 20 cooperative banks of the states and 2841 district cooperative bank. The Farm Credit System USA of Cooperative Bank system represents as the main lender of American farmers.

Credit unions are unique financial institutions with a public orientation. They represent a form of mutual financing, or collective self-financing, that emerged in response to the difficulties small and medium-sized businesses face in accessing loans from commercial banks. The advantages of credit cooperatives compared to commercial banks are:

- lower interest rates than all other banking structures;
- the possibility of minimal investment;
- the possibility of obtaining both small and large amounts of loans for the purchase of land on collateral, or on the terms of guarantees of members of the cooperative (loan circle);
- simpler procedure for obtaining a loan and its smooth receipt at any time;
- the opportunity to get a loan for savings;
- higher level of credit service security in own financial institution;
- less rigidity in case of late repayment of loans;
- the perception of the owner of a banking institution and participation in the life of its members.

Lower interest rates than commercial banks are provided by the non-profit status of cooperative banks. The purpose of their activities is to provide their members with services at rates that do not involve bank profits, as is the case in commercial banks.

Cooperative banks engage in a comprehensive range of mortgage-related operations, including lending, issuing land mortgage securities, securing necessary financial resources, and refinancing newly issued loans.

The main sources of finance for cooperative banks are:

- state budget funds;
- proceeds from the placement of mortgage bonds secured by agricultural land;
- funds of agricultural producers – members of cooperative banks, which are transferred to cooperative banks;
- loans raised under government guarantees in international markets.

The preferential long-term cooperative credit system for agricultural land acquisition by farmers is augmented by state non-bank credit institutions. In the United States, this “tandem” with the cooperative Farm Credit System is represented by the Farm Service Agency (FSA).

The FSA provides financial support to farmers and ranch owners who are unable to obtain a loan in case of force majeure to expand their farm or establish a farm from other sources. The agency also lends to young and other farmers and ranch owners who are starting their own businesses. Credit support programs for women and minority farmers have been singled out. The FSA provides loans to these categories of farmers for the purchase of land or farms in general, as well as to cover the costs of farms for the period of their formation.

Loans for owning a farm or land account for 100% of their value. The maximum loan amount is $ 600,000. The agency handles loans through its local credit managers and farm managers. Funding is provided from the US Department of Agriculture budget. The FSA also acts as a guarantor of loan repayment if the farmer takes half of the loan amount from another borrower. The maximum loan repayment period for the purchase of a farm, as well as a joint loan with another financial institution, is 40 years (FSA).

In Canada, the agricultural credit cooperative system is complemented by the state-owned Farm Credit Canada (FCC). The Corporation is accountable to the Government of Canada and operates under the Canadian Agricultural Credit Laws and the Financial Management Act. The purpose of the corporation is to promote the development of agriculture and rural areas of Canada by providing specialized and personalized business and financial services for the organization of agricultural activities by farms, including family farms.

For Canada, as for almost all developed countries, the issue of “rejuvenation” of farmers is important. To solve this problem, the FCC offers a soft loan to young farmers, which promotes the settlement of young people in rural areas and facilitates the transmission of business from generation to generation. The FCC also has a strategy to support women entrepreneurs in agriculture by providing them with personalized loans, financial, advisory and other services.

The FCC cooperates with the system of credit cooperatives and other financial institutions in matters of common interest in credit services to agricultural producers (FCC).

To support the income of small and medium-sized producers and ensure their profitability, enabling them to effectively conduct business at the level of expanded reproduction, a range of government measures is employed to mitigate the negative effects of the aforementioned factors on the economy and to protect them from losses associated with mortgaged land. The mechanisms for enhancing farmers' financial capabilities are beyond the scope of this study. For illustrative purposes, it is noted that in Germany, direct budget support for farm profitability amounts to 346 euros per hectare, with additional support related to agricultural land development totaling 82 euros per hectare, bringing the total support to 428 euros per hectare. In comparison, the total state support for farmers is 357 euros per hectare in France and 317 euros per hectare in Poland (Zbarsky, 2015). In the United States, state subsidies account for 20% of the cost of farm products, while in England, this share exceeds 25%. In the European Union, state subsidies constitute 28% of farm product costs. In Sweden, Norway, and Japan, the share of state subsidies is significantly higher, reaching 60% (Suprun, 2019). All types of state support are provided through the above institutions.

In Ukraine, there are no specialized financial institutions for servicing agricultural producers, in particular, small and medium-sized ones. An analysis of the practice of commercial bank lending shows that these institutions are interested in working only with those who use 500 or more hectares of agricultural land. Credit Agricole Bank in Ukraine issues loans to farmers with land use of 200 hectares. Thus, banks are not interested in personal peasant economies and a significant part of farms, which produce up to half of all agricultural products.

On the part of small farms, credit rates are a stop factor for appealing to banks – for individuals they are significantly higher than for corporate loans. Credit rates are also higher for small and medium-sized farms, who are legal entities. According to National Bank of Ukraine, in 2020 the weighted average rate for use of loans in agriculture was 13.9% per annum, and for small and medium-sized agribusinesses is an average of 20 – 22%.

Since 2000, Ukraine has had a mechanism for partial compensation of interest rates on loans from private banks. However, farmers hardly use this program due to the high upper limit of the repayable loan rate, high mortgage (up to 300% of the loan amount), advance payment requirements of up to 30%, credit terms in which farmers cannot invest. Only large agro-industrial and commercial enterprises have a chance to get loans, which can provide acceptable mortgage for banks.

In Ukraine, there is a non-bank specialized financial institution the Ukrainian State Fund for Farm Support (Ukrderzhfond). However, its functions are, first, limited to small amounts of short-term credit resources, which are mostly used to replenish fixed assets. A quarter of loans are used for the purchase of machinery and equipment, and a fifth of them are used for production activities. We are not talking about targeted long-term loans through the Ukrderzhfond. Secondly, the functions of the Fund do not apply to the maintenance of personal peasant economies.

Restructuring and extension of the functions of this non-bank financial institution to preferential, including long-term lending to farmers and private farms, as well as granting the Ukrderzhfond the status of a guarantor of repayment of loans issued by others, including banking financial institutions, considering foreign experience important and urgent task of the government.

Regarding the second main component of lending to small and medium-sized farms, it should be noted that the legal regulation of the establishment and operation of cooperative banks in Ukraine is significantly limited and does not define their essence as cooperative's non-profit credit institutions.

The reference of Article 8 of the Law of Ukraine "About Banks and Banking Activity" №2121-III of 07.12.2000 (About Banks, 2000) to the current cooperative legislation is insignificant, as in the Laws of Ukraine "About Cooperation" №1087-IV of 10.07.2003 (About Cooperation, 2003) and "About Agricultural cooperation" № 819-IX dated 21.07.2020 (About Agricultural, 2020) does not mention cooperative credit formations. Therefore, agricultural cooperative banks cannot be registered as service cooperatives with non-profit status.

The standardization of minimum capital for a cooperative bank cannot stand any criticism. As in Poland it is much smaller and amounts to 1 million euros. In Ukraine, on the other hand, the amount of standardization of the minimum capital for a cooperative bank is about 200 million UAH, which is within 7 million euros. This makes it practically impossible for agricultural producers to create such structures.

This proves the necessity to make significant changes and additions to current banking legislation, or to adopt a separate framework Law of Ukraine "About Agricultural Cooperative Credit" with a focus on the formation of cooperative banks of European single-level credit system for agricultural producers with a closed cycle of mortgage transactions.

Legislation of credit unions also contains significant gaps. First of all, the cooperative legislation does not regulate them in the status of a non-profit service cooperative. According to the Law of Ukraine "About Credit Unions" № 2908-III of 20.12.2001 (About Credit, 2001) these formations are non-profit organizations. However, the Law of Ukraine "About Financial Services and State Regulation of Financial Services Markets" № 2664-III of 12.07.2001 (About Financial, 2001) legalizes credit unions by financial institutions along with banks and other institutions that provide services for profit.

Contradictions of legislation on the economic (non-profit) nature of credit unions radically change the natural essence of these credit institutions, which makes them unprofitable.

The organization of the system of cooperative credit institutions, as a rule, is carried out on the initiative and financial support of the state. In the United States, for example, the Farm Credit System was formed by a decision of the US Congress in accordance with the Federal Agricultural Credit Act (1916). Initial government subsidies amounted to $125 million, which was a significant support at the time. With the participation of the state, a cooperative system was formed in Japan, India, and European countries.

Taking into consideration the common foreign practice, one of the following three options for public financial support for the development of a cooperative credit system in Ukraine can be used:

According to the first option, for the formation of the capital of local (regional) cooperative banks (institutions of the 2nd level*)* the state allocates funds from the budget for the formation of capital of cooperative banks under the condition that grassroots cooperative credit organizations undertake to repurchase from the state the relevant shares in the share capital of cooperative banks within a certain period (to 30 – 40 years).

The government provides credit unions with the required amount of credit, subordinated for any agreed period (for example, 10, 15 or 20 years or more) at low interest rates.

According to the second option, the state finances members of the cooperative banking system. This option can be used if part or all of the funds received as compensation for interest rates on bank loans (and possibly from other trust funds) will be used to create regional cooperative banks to create a cooperative banking system.

Thus, joint and coordinated actions of the state, producers, their cooperatives will allow to form in Ukraine an effective system of financial and credit support of small and medium-sized businesses with financial resources for the purchase of land.

Under the third option, the cooperative banking system is financed by all participants. This option assumes that the capital formation of cooperative banks is at the expense of lower-level members, the system of funds used as compensation of interest rates and budget funds.

In order to support the assets of cooperative credit institutions, distribution of state subsidies and soft loans should be provided through them to agricultural producers and their associations.

It is important to note that the territorial principle of creating cooperative credit structures binds them to a specific territory and community where their members live and work. Thus, the formation of a system of rural credit unions and local cooperative banks is a form of financial "decentralization" of funds, which plays an important role in ensuring the effective development of rural areas "from the bottom up" (Svereda, 2018).

Discussion

The comparative analysis of financial and credit services for agricultural producers reveals significant disparities between the practices observed in developed countries and those in Ukraine. Specialized financial institutions such as cooperative banks and credit unions play a crucial role in supporting agriculture in various international contexts. Their success is largely attributed to their ability to offer lower interest rates, more flexible loan terms and tailored financial services that cater to the unique needs of small and medium-sized farms.

In the European Union, cooperative banks such as Credit Agricole in France and Rabobank in Netherlands exemplify effective models of agricultural financing. These institutions leverage their non-profit status to provide affordable credit, thereby facilitating the acquisition and development of agricultural land. Similarly, the Farm Credit System in the United States and Farm Credit Canada demonstrate the importance of state involvement in sustaining agricultural finance. The U.S. Farm Service Agency's role in providing loans to underserved farmers, particularly those facing force majeure, highlights the necessity of safety nets in agricultural finance.

However, the situation in Ukraine underscores several critical challenges. The absence of specialized financial institutions for small and medium-sized agricultural producers, coupled with the high interest rates and restrictive lending conditions imposed by commercial banks, creates a significant barrier to accessing necessary financial resources. The limitations of the Ukrainian State Fund for Farm Support and the regulatory inconsistencies regarding cooperative banks and credit unions further exacerbate these challenges.

Addressing these issues necessitates a comprehensive reform strategy. Drawing on international best practices, Ukraine should consider implementing a framework that supports the development of cooperative credit institutions with a non-profit orientation. This includes revising the legal and regulatory environment to enable the establishment of agricultural cooperative banks and credit unions, as well as exploring options for public financial support to seed capital for these institutions.

Furthermore, adopting a decentralized approach to financial services, as seen in successful models abroad, could enhance the accessibility and effectiveness of credit services for Ukraine's rural communities. By fostering collaboration between state institutions, financial organizations and agricultural producers, Ukraine can build a more resilient and inclusive financial system that supports sustainable agricultural development.

Summary
The development of specialized financial and credit systems for agricultural services in global practice indicates that such systems are indispensable, particularly for small and medium-sized agribusinesses.
Elimination of the problems in Ukraine highlighted in the article requires consolidation of efforts of professional agricultural organizations, scientists, agricultural authorities and legislators in order to implement the experience of Western European and other countries in organizing agricultural cooperative credit and state non-banking structures to maintenance agriculture in national law and practical activities.

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STEPS TOWARDS SUSTAINABLE RURAL DEVELOPMENT. A COMPARISON BETWEEN BULGARIA AND ROMANIA AFTER 17 YEARS IN THE EU

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Abstract
The two European neighbor countries, Bulgaria and Romania, have a tangled history and share more than the Danube boarder and their location in the Balkan area. They have shared part of their history, culture, religion and traditions. Even more, they constantly compare to one another in terms of development. This closeness has led to European political and strategical decisions to be made commonly for both countries, such as the adhesion to the European Union (EU) in 2007.
After a considerable period of being full members of the European Union, Bulgaria and Romania still face similar challenges and are frequently seen as a whole by other members of the EU when important decisions, like adhering to the Schengen area, are made. Nevertheless, Bulgaria and Romania have been full members of the EU for 17 years and need to contribute to the same goals as every member of the EU, including sustainable rural development, currently implemented through the Sustainable Development Agenda.
This paper aims to analyze the evolution of the two neighboring countries in this regard by using statistical data from Eurostat bearing in mind the Sustainable Development Goals (such as Area under organic farming or Persons at risk of poverty or social exclusion in rural areas) by using a multicriterial analysis.
Some findings suggest that, while both countries have a small percentage of agricultural area converted to organic farming, Bulgaria currently shows a decrease in this area, while Romania is slowly increasing the organic cultivated area. Also, the rate of people at risk of poverty and social exclusion is decreasing for both countries, Bulgaria showing a more accelerated pace. Yet, these two countries are considerably behind the EU average for this social indicator. In Bulgaria being around 39%, in Romania around 45% and around 21% for the EU average. Therefore, these two countries have a difficult time in providing social improvements dedicated to the rural areas. Even more, this piece of research points out that little of the data regarding sustainability available on Eurostat is focused on the rural areas. Therefore, a clear differentiation between stages of development and possible strategies for the rural areas are impossible to make. This comes also as a limitation of this research. The paper points out the current state of sustainable development in the rural areas of the two countries and the weak spots regarding data gathering for enabling proper analysis and should be of interest to both scholars and public decision-makers for further analysis.
Key words: development; rural development; sustainable development; neighbor countries; evolution, SDG
JEL code: Q01; Q50; Q10

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Introduction

Sustainable development has become a trending phrase, used to describe the current developmental orientation in all domains. Rural development makes no difference in this case. The Brundtland Report (Burton, 1987) considers sustainable development as a current development rate that does not affect the developing possibility of future generations at least at the same rate.

The rural area is difficult to define, and this definition differs due to factors such as political or administrative ones and most of area is rural, rather than urban (Arellano and Roca, 2017). Other authors (Popescu et al., 2018) highlight the fact that rural is often seen as a physical, economic, social and cultural entity opposed to the urban, while the OECD and the EU (Dax, 1996) understand it as non-urban or peripheral to urban areas based on the people density per square kilometer. Therefore, the vagueness of these definitions in relation to rural areas have led to a higher need for research in this area so to allow development programs to fit also to the rural. Several authors describe the need for a new narrative (Ashley and Maxwell, 2001) or consensus (De Janvry, Sadoulet & Murgai, 2002) in what comes to mind regarding rural development and rural policy, especially considering that the world's most poor livelihoods are rural (De Janvry, Sadoulet & Murgai, 2002).

The EU has kept close to the rural area through its agricultural and rural development policy and funding programmes, providing a framework in this area through the Common Agricultural Policy that is one of the earliest and most important frameworks of this structure (Ludlow, 2005). There are also authors who claim that the CAP should be restructured (Hubbard and Gorton, 2011) due to its failures so far. The effects of funding on agricultural development have been studied by many authors such as Constantin (2019), Kalinowska et al. (2022) or Stoian et al. (2022).

The structure of the financing programs in the EU is a seven-year cycle and considering the fact that Bulgaria and Romania have been candidates for the EU and then full members of it in the same years, they benefitted from pre-adhesion funds until 2007 and full funding since then.

The funds received for rural development and agriculture during 2000 and 2006 have mostly helped the two candidates in aligning their producers and businesses to the EU standards. The main interest domains that were considered at that point were: Farms, Diversification of economic activities in the rural area, Forming agricultural, forestry and fishing producers' groups, Ecological methods for agriculture and Forestry (AFIR, 2024; EU Commission, 2024). After 2007, when Bulgaria and Romania were declared full members of the EU, the funding priorities for the rural area focused on: increasing economic competitiveness, improving the environment and rural space, improving the quality of life and diversifying the rural economy and LEADER (local action groups, local strategies etc.) (ARDM, 2024, EU Commission, 2024). After 2014 the priorities included consultancy and knowledge transfer, physical investments, developing farms and other enterprises, renewing villages, forestry investments, forming producer groups and cooperation, agri-environmental and climate, ecological agriculture, payments for areas with natural restraints, animal welfare, forestry services, risk management and LEADER (ARDM, 2024, EU Commission, 2024). Since 2020, the funds directed to agriculture and rural development have been included in national strategical plans and they aim more towards farm resilience in European context and increasing competitiveness through market orientation, improving the role of the farmer and attracting new young farmers, climate change alleviation, natural resource management, improving the quality of life in rural areas, increasing food security and safety and knowledge transfer (ARDM, 2024, EU Commission, 2024).

The paper is structured in three main chapters. First, some introduction remarks to set the context are made, followed by the objective of the paper and the research methodology. Second, the main findings of the paper are presented. Last, a series of conclusions are drawn based on the findings and other observations derived through this analysis.

Objective of the paper

The present paper aims to analyze the evolution of indicators related to sustainable rural development as they appear on Eurostat for Bulgaria and Romania and the EU average, in order to see how the two countries, align with the ambitions regarding the Sustainable Development Goals (SDG) related to the rural area.

Research methodology

With a total area of 111.000 km^2 of which 46.5% is rural area for Bulgaria and a total area of 230.080 km^2 of which 56.8% rural for Romania (World Bank, 2024) in 2021, the two countries have a considerable rural population and area that needs to be considered when speaking about sustainable development. Also, since 2007, the two countries benefited from European funding dedicated to the rural area and some considerable improvements in the sense of achieving the SDG’s should be seen. Therefore, the present study aims at presenting a simple quantitative analysis by selecting multiple criteria in the form of statistical indicators available on Eurostat for both countries, since 2007 where available, regarding sustainable rural development and to see how they evolved by comparing the countries to one another and the EU average. The indicators that will be considered are: Persons at risk of poverty or social exclusion by degree of urbanization (under SDG 1 – No poverty); Area under organic farming and Use and risk of chemical pesticides (under SDG 2 – Zero hunger).

Due to the fact that few of the SDG indicators are calculated differently for the rural area, the picture is completed by other agri-environmental indicators available on

Eurostat: Final energy consumption by agriculture/forestry per hectare of utilized agricultural area and Ammonia emissions from agriculture as percentage of total emissions.

Findings

The results of the quantitative analysis regarding the evolution of the selected indicators are presented in the following lines.

In Figure 1 the percentage of people at risk of poverty in the rural areas is decreasing for Bulgaria and Romania at a similar rate, from around 60% in 2015 to less than 50% in 2023. Yet, the percentage in lower in Bulgaria and the decrease rate is higher here. Nevertheless, the two countries are far behind the EU average, which has gotten to around 21% in 2023. The decreasing pace is slower for the EU average, but the difference between these two countries and the EU average points out the need for social policy improvements dedicated to the rural areas of Bulgaria and Romania.

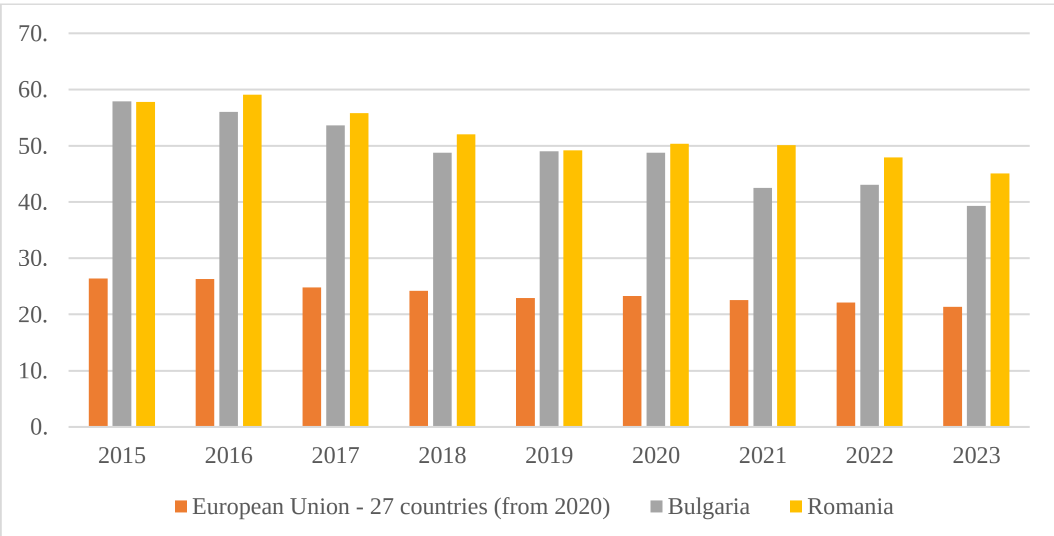

Figure 1. Persons at risk of poverty or social exclusion in rural areas (%)

Source: own processing after Eurostat data, 2024

While we could say that the funding for increasing the quality of life have an influence on the reported decrease in this indicator, the assumption might be unfunded and the decrease could be just a natural one, driven by the general state of development of the two countries.

In Figure 2 the percentage of areas under organic farming, in conversion or fully converted, is presented. While the data for the EU average is incomplete for the selected time frame, the given values are considerably higher than those in Bulgaria

or Romania, they reach 9% in 2020, while for the two countries the percentage is under 4%. Considering the trends followed by the two countries, Bulgaria shows an increase, with a maximum point of 3.2% in 2016, followed by a steady decrease to 1.7% in 2021. For Romania, the trend is slightly fluctuating, having a lower period in 2015-2017, than increasing to almost 4.5% in 2021.
A clear correlation between the funding for organic farming and these trends is difficult to make, especially due to the opposed trends followed by the two countries.

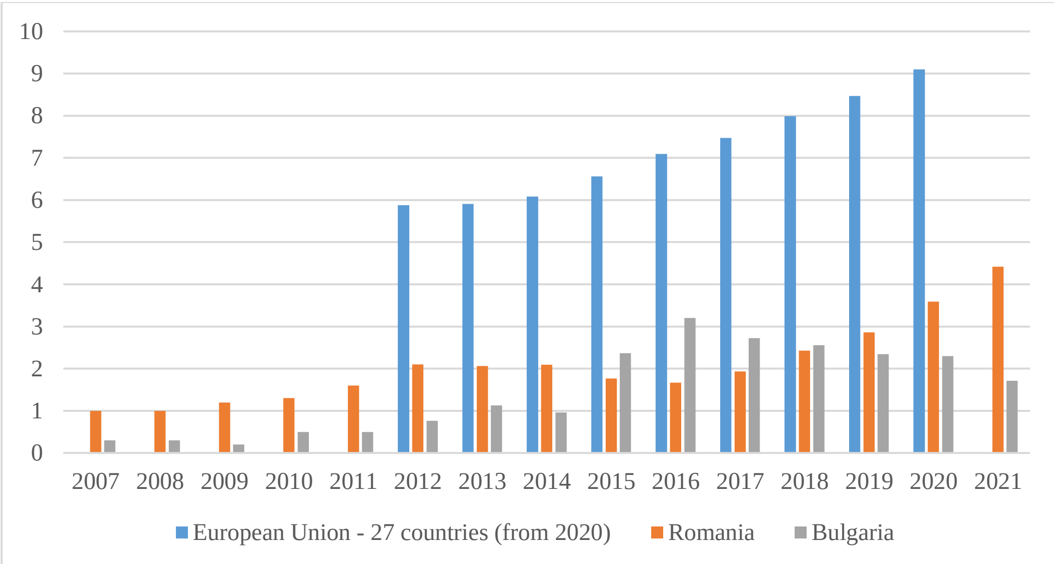

Figure 2. Area under organic farming (% of total UAA)

Source: own processing after Eurostat data, 2024

The calculated index for risk and the use of chemical pesticides shows a general decreasing trend for all three analyzed structures. While for the EU average the index is lower than 117 since 2011 and reaches a value of 67 in 2021, both Bulgaria and Romania show some fluctuations. Bulgaria has a maximum point of 300 in 2011, then drops to the lowest points during 2012 – 2014 (a value of only 30 in 2014) only to reach other high points in 2018 (of 180) and 2019 (of 193) and to drop again to a value of 85 in 2021. Romania has the highest point in 2012, with a value of 196, then decreases and finds itself on a similar scale to the EU average since 2017 and reaches the lowest point in 2021 with a value of 56.

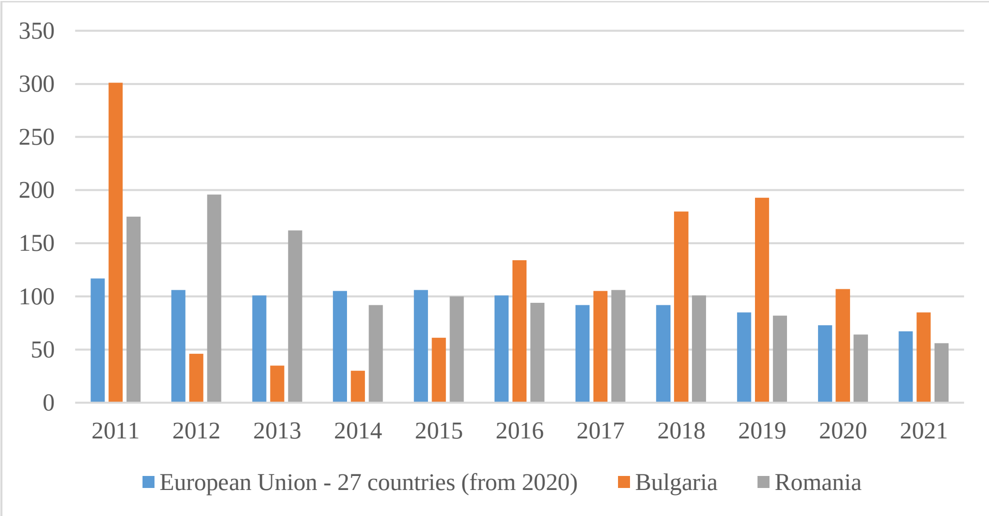

Figure 3. Use and risk of chemical pesticides (calculated index)

Source: own processing after Eurostat data, 2024

The EU regulations regarding the use of pesticides should be the reason for the observed decreases, since Bulgaria and Romania are Member States and their agricultural products sold on the EU market must fall under the EU standards and regulations.

The fourth Figure refers to the energy consumption in agriculture and forestry per hectare as sum of energy used. This indicator points out the fact that Bulgaria and Romania use considerably less energy in agriculture and forestry than the EU average. This should not be seen as a positive result of EU funding, but as a need for further funding regarding agricultural modernization (in irrigation, mechanization, digitalization) in the two countries.

While the value of this indicator seems almost constant during 2011 and 2022 in Bulgaria and Romania, remaining around 40, the value of this indicator in the EU reaches the highest point of 177 in 2021, but it is never below 150 in the analyzed period.

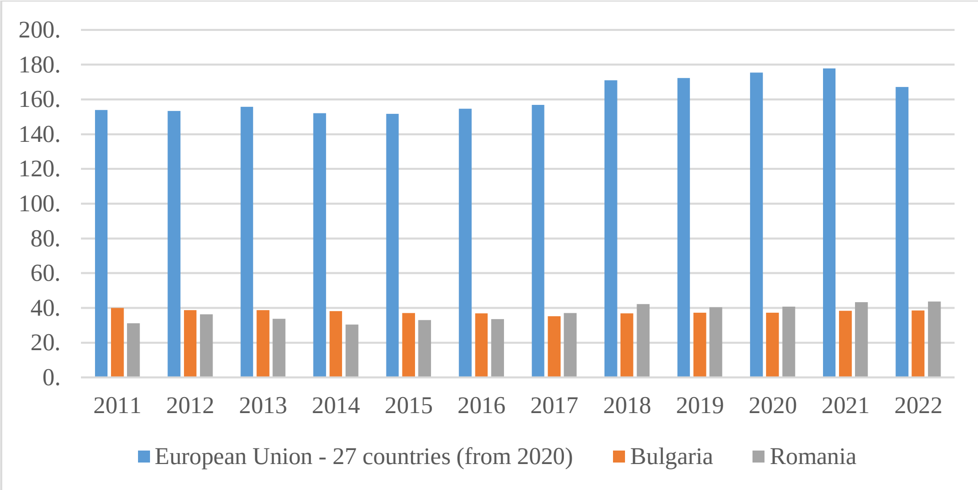

Figure 4. Final energy consumption by agriculture/forestry per hectare of UAA (value)

Source: own processing after Eurostat data, 2024

The final indicator analyzed is related to the ammonia emissions from agriculture. In Figure 5 we may see that the emissions are lower in Bulgaria and Romania then the EU average, which should be correlated with the lower development of agriculture in the two countries. Yet, the percentage is significantly increasing, at a similar rate in both countries, from 84% in Bulgaria and 85% in Romania in 2010 to 88% in Bulgaria and 89% in Romania in 2021. The EU average, on the other hand, is rather constant, with percentages between 90 and 91% during the analyzed period.

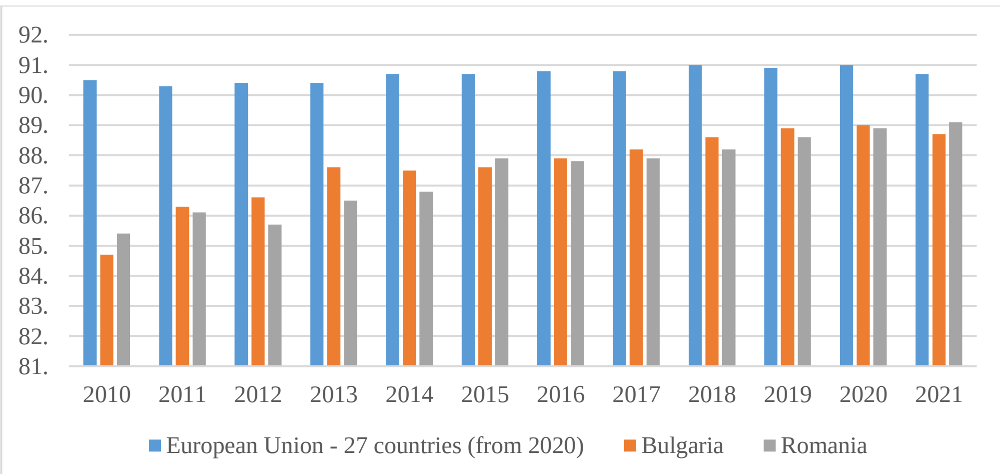

Figure 5. Ammonia emissions from agriculture as percentage of total emissions

Source: own processing after Eurostat data, 2024

Conclusions

Considering the analyzed indicators, we may say that the agricultural and rural development funding dedicated to Bulgaria and Romania helped in areas such as increasing mechanization due to the increase of energy use in agriculture and increased the area under organic farming in both countries, even if the values are considerably lower than the EU average.

The only indicator that may be correlated with the quality of life specifically for the rural areas is the percentage of people at risk of poverty which shows very high values for Bulgaria and Romania compared to the EU average, even though they are slowly decreasing.

Even though there are several measures in both countries regarding improving the quality of life and renewing or revival of the rural areas, and this could easily be connected to more than one SDG, the indicators are not differentiated by rural-urban criteria, so analyzing them would be out of the scope of this paper. This is a limitation of this research that should be filled first by the authorities who are responsible for the right implementing of EU programs and regulations by gathering data differentiated by rural and urban for the majority of the indicators in order for specific analysis to be carried out by researchers and therefore differentiated strategies to be provided.

Therefore, the sustainable development of the rural area in Bulgaria and Romania might come more from the lack of mechanization and use of pesticides compared to the EU average than from funding dedicated to its development.

This paper fills a picture related to the level of development considering different indicators that may be correlated to sustainable rural development and points out that the use of EU funding for rural development in these two countries has not brought a significant social and environmental improvement and should be of interest to both fellow researchers and public resort authorities.

More research in this area might select different Member States for comparison or different indicators in order to paint a larger picture regarding sustainable rural development.

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POPULATION IN RURAL AREAS – TWENTY YEARS OF POLAND'S MEMBERSHIP IN THE EU

WRZOCHALSKA, AGNIESZKA[1]

Abstract
Since the beginning of the 21st century, a few positive changes have taken place in rural areas in Poland, including those concerning rural society. At the same time, the countryside has begun to become an attractive place to live, especially areas located near cities, well connected to them. The aspirations and needs of the rural population have begun to resemble the needs of city dwellers. The lifestyle of residents in cities and rural areas has begun to become more uniform. A smaller and smaller percentage of the population has begun to work in agriculture. Several non-agricultural jobs have been created in rural areas, and non-agricultural jobs are also available in nearby towns. Therefore, expanding the educational competences or the level of formal education of the rural population to increase its importance on the labor market in the city and in the countryside is very important. At the same time, both the average size of the farm and the scale of neighboring leases have increased (Karwat-Woźniak, 2015; Karwat-Woźniak and Buks, 2022) and, to put it simply, it can be noted that even in one village, only a few professionally trained farmers (Doichinova, Stoyanova, 2020) run a farm.
A positive phenomenon is the increase in the life expectancy of Polish residents, but at the same time, the progressive process of population ageing has been noted. During the period of EU membership, the rural population realized its educational aspirations by increasing the level of education and reducing educational differences in relation to the population in cities. Activities to popularize adult education have become important, consisting both in improving accessibility and in raising awareness of the benefits of lifelong learning and acquiring civilizational competences, including improving digital skills. It should be noted that the course of demographic phenomena, starting from 2020, was greatly influenced by the outbreak of the COVID 19 pandemic, which contributed to a higher number of deaths than in previous years and thus deepening the unfavorable trends of population ageing that have appeared in the last dozen or so years in our country and Europe.
The article is an attempt to make a social, and primarily demographic, characterization of rural residents in Poland at the threshold of the third decade of the 21st century and the changes that have taken place in this area over the last twenty years.
Keywords: rural areas, demography, education, digitalization
JEL: J10; J11, J14, J24

Introduction

Integration with the European Union and the inclusion of Polish agriculture in the Common Agricultural Policy (CAP) was the next stage of changes in rural areas and in Polish agriculture, which were initiated in the last decade of the 20th century.

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Poland's accession to the EU resulted in the inclusion of the Polish agricultural sector in the supranational agricultural policy – CAP, which is a set of policies for individual segments of agriculture, agricultural markets and structural policies. In this way, it determines the economic conditions in rural areas and the functioning of the agricultural sector of the EU member states. On the one hand, it creates opportunities for agricultural production and guarantees its appropriate size and quality. On the other hand, it constitutes the basis for social and economic development for the rural population (Doitchinova, Wrzochalska, 2022) and affects the level of environmental and landscape protection. This means that, in accordance with the adopted principles, this policy was intended to stabilize the situation in agriculture and improve the living conditions of the rural population.

Methodological framework

The aim of the publication is to analyze the demographic potential in rural areas, including trends in population changes and transformations in the demographic structure. The level of formal education of rural residents was also analyzed, including issues related to adult education and digital skills in the context of contemporary civilization requirements. The following indicators were used for statistical and descriptive analyses: population structure divided into biological age groups: 0 – 14, 15 – 64, 65 and more (or 0 – 14, 15 – 59, 60 and more), median age (median age of the population), demographic dependency ratios, generational support ratios, share of the oldest people (aged 80 and more in the population over 65) and potential number of years to live.

The metric threshold of old age, in accordance with WHO assumptions, was assumed to be 60 years. The research material consists of data from the Central Statistical Office and publications on the subject matter under study. The sources of data on the infant mortality rate in rural areas, the number of people in Poland who changed their permanent place of residence, the period in which this phenomenon occurred, the median age of the population, the expected duration of life in health, the enrollment rate, and the data needed to calculate the potential support rate are the mass statistics data from the Central Statistical Office, mainly for the years 2022 – 2023 in relation to 2004 or 2005.

Analysis of demographic processes

Over the last twenty years, the population in rural areas has increased by over 582 thousand. The observed gradual increase in the number and percentage of rural residents in the total population of the country was caused primarily by the migration of people living in cities to rural areas, located mainly around large, urbanized areas. (Stanny, Rosner i Komorowski, 2023). Despite the annual population loss in the age group of children and adolescents and people of mobile productive age, with a simultaneous increase in the number of people in older age groups, rural areas were characterized by relatively better indicators than cities (Table 1).

Table 1. Selected demographic indicators in rural and urban areas in 2003 – 2023

Specification	2004	2015	2023	2004 – 2023
Rural areas				
People aged 65 and over per 1,000 children aged 0 – 14	668	852	1031	+363
Number of people of post-productive age per 100 people of productive age	26	27	34	+8
Non-working age population per 100 working age persons	69	58	68	–1
Potential support factor	490	499	385	–105
Parent care factor	6,2	9,2	9,7	+3,5
Urban areas				
People aged 65 and over per 1,000 children aged 0 – 14	818	1213	1578	+760
Number of people of post-productive age per 100 people of productive age	23	34	44	+21
Non-working age population per 100 working age persons	53	61	73	+20
Potential support factor	571	405	291	–280
Parent care factor	4,3	9,2	13,2	+8,9

Source: GUS, 2005, 2016, 2024a

Another positive phenomenon is the increase in life expectancy. Already at the threshold of the third decade of the 21st century, the average resident of rural areas is older than twenty years ago. Currently, a man aged 60 has 17.4 years of life ahead of him, and a woman 23.0 years, so they will live over a year longer than their peers from the year 2000. Forecasts predict that a newborn boy born today will live 3.6 years longer and a girl 2.7 years longer than newborns born at the beginning of the first decade of the current century. Despite the increase in the life expectancy of the population observed throughout the entire period under review, in 2020 the number of life expectancies decreased, including people over 60, compared to previous years. One of the main causes was the COVID-19 pandemic, which directly contributed to 8.7% of deaths in Poland. In the case of seniors, it was 9.1% of deaths (GUS, 2021b). However, over the last 20 years, a progressive process of population ageing has emerged both in Poland and in rural areas. Population ageing is an irreversible and universal phenomenon, and the development of society (its development phase) has an impact on this state. The main causes are: delaying the age of entering into relationships and the age of mothers giving birth to children, decreasing birth rates, which also results in a smaller number of potential mothers in the future, low fertility rates and a low level of natural increase. International migrations also have an impact, which mainly concerns young people and affect the distortion of the population structure.

Population ageing, according to the adopted definitions, means an increase in the percentage of elderly people while simultaneously decreasing the percentage of children. WHO adopts 60 years as the metric threshold of old age. UN and Eurostat 65 years. According to the UN criterion, the population is considered old when the share of people aged 65 and over exceeds 7%. A percentage above 10% indicates advanced old age (GUS, 2014). In rural areas, the percentage of people aged 65 and over was 13.5% in 2004, which is almost twice as high as when, according to the adopted UN criterion, the population is considered old, and in 2023 this percentage has already reached 17.2%. The population in cities in 2004 was characterized by a percentage of people in this age group at 12.5%, which by 2023 had increased to 22.1%.

In Poland, in rural areas and in cities, in the analyzed period, the percentage of people of senior age gradually increased. The intensification of the ageing process of residents, in both groups, was visible primarily in the second decade of this century. In the group of people of post-working age, the number of people in the age group over 85 increased. In rural areas in 2023, there were over 280 thousand such people, and their number increased by almost 150 thousand people over twenty years.

The quantitative relationships between older and younger groups of people and the possibility of supporting older generations are reflected in the support coefficients: the potential support coefficient and the parent care coefficient. The potential support coefficient indicates the number of people aged 15 – 64 per 100 people aged 65 and over.

The parent care coefficient indicates the number of people aged 85 and over per 100 people aged 50 – 64 (GUS, 2014). The first of these measures in 2004 was at the level of 490 in rural areas and 571 in cities (Table 1). In 2023, this indicator decreased to the level of 385 in rural areas and to the level of 291 in cities. The second indicator – the parent care coefficient in 2023 reached the level of 9.7 in rural areas and 13.2 in cities. In 2003, this indicator was 6.2 in the countryside and 4.3 in the city. This significantly highlighted the unfavorable relations in both groups in relation to previous years. The level of indicators shows that the population of both cities and the countryside is in the phase of advanced old age.

The progressive process of ageing of society will cause an increase in the percentage of senior citizens (over 60) in the coming decades. According to the forecast of the Central Statistical Office, in 2030 in rural areas the percentage of people in this age group will be 26.3%, and in cities 31.0%. By 2050, these values will reach 37.8% (rural areas) and 42.2% in cities, respectively. It can be assumed that the senior citizen in the coming decades will play an increasingly important role in shaping the demographic structure of society, including rural ones.

Analysis of education and civilizational competences

An efficient education system is one of the conditions for increasing employee productivity and the competitiveness of the Polish economy. Regardless of increasing the average effects of education, its important task is to effectively equalize the development opportunities of people from different environments and areas. In the entire period of the last twenty years, favorable changes have been noted in relation to the level of education of society in Poland, including rural society. In the countryside, as in cities, the educational aspirations of society have increased, and the disproportions in relation to urbanized areas have gradually decreased at each stage of education.

After twenty years of EU membership, the participation of Polish children aged four and older in pre-school education has approached the EU average, but the participation rate is still low for younger children, especially 3-year-olds. The problem mainly concerns rural areas, where there is still an insufficient number of places in such facilities. As a result of the noted positive impact of European funding on the dissemination of pre-school education, in the last twenty years, there has also been a two-fold increase in the share of children aged 3 – 6 covered by pre-school education in rural areas. In the 2022/2023 school year, 712 out of 1000 children in this age group participated in this form of educational care. Despite activities financed from both national and EU funds to improve access to care for the youngest children, Poland is still one of the European countries where the participation of children under 3 years of age in institutional care is particularly low, due to the insufficient number of care places.

The dispersion of rural areas required a larger number of schools than in cities and a smaller number of students. On average, over one hundred and thirty students attended a rural school, while in cities, almost four hundred. Considering the spatial availability of primary schools in rural areas, it should be noted that almost one fifth of students lived within 3 – 4 to 5 km of the facility, and over one fourth of students were transported to schools. Special education facilities for particularly gifted children (e.g. sports) are rare in rural areas. Special schools are located there more often, where children with developmental disabilities can attend. However, the number of these schools and their availability was significantly lower than in urban areas and included fewer students.

In the period after Poland joined the EU, difficulties with maintaining the operation of schools became apparent in some rural areas. In the case of primary schools, their number systematically decreased and in the 2022/23 school year was lower by over a quarter compared to 2003/2004. In the case of secondary education, students from rural areas in most cases used schools in nearby towns, because there were only a few such institutions in rural areas. In the last few years, students most often chose general secondary schools, which were attended by almost half of the students in this group of schools. At the same time, a systematic increase in interest in schools enabling vocational training was also observed during this period. On the other hand, a decrease in the share of students of basic vocational schools/vocational schools of the first degree and general secondary schools was noted. It should be emphasized that over the past twenty years, the school system has undergone reforms and students and teachers, as well as parents, have had to additionally face the challenges caused by the outbreak of the COVID-19 pandemic. It should also be emphasized that throughout the entire period under review (2003 – 2022), the average results of students in Poland, in the three areas of the PISA study, were higher than the average for OECD countries and the average for EU countries, and relatively few countries achieved better results than Poland. This indicates a high level of educational skills of teachers and students and good preparation for education at higher levels of education.

In the entire period of the last twenty years, positive changes were noted in relation to the level of education of society in Poland, including rural society (Table 2).

Table 2. Education level of the population aged 15 – 64 in 2004 – 2021

Years	Higher	Post-secondary and secondary	Vocational secondary	Secondary	General vocational lower secondary	Unior high school, primary and lower
Rural areas						
2004	5,8	19,7	17,6	6,1	36,8	31,7
2015	14,6	23,3	21,1	8,8	32,7	20,5
2021	18,6	25,4	23,3	10,1	29,3	16,5
Urban areas						
2004	17,0	27,5	23,7	12,3	25,5	17,7
2015	31,0	24,6	21,0	11,9	20,8	11,7
2021	36,7	24,3	20,8	11,4	17,2	10,5

Source: GUS 2005, 2016, 2024b.

In the countryside, as in cities, the educational aspirations of society have increased, and the disproportions in relation to urbanized areas have gradually decreased. In rural areas, the share of people with higher education in the population aged 15 – 64 has increased almost fourfold. The percentage of the rural population with post-secondary and secondary education has also increased, while the percentage of people with the lowest level of education has decreased. These positive changes were primarily influenced by changes in the demographic structure, because lower levels of education mainly concerned people from older age groups. Currently, every sixth resident of rural areas, aged 15 – 64, has completed higher education, and every fourth has semi-higher or secondary vocational education. Two out of three rural children aged 3 – 5 are provided with early educational care in kindergartens.

In the modern world, the pace of so-called knowledge aging is relatively fast, especially in relation to specialist knowledge. Therefore, the learning process should not be identified with a single, separate stage of life. A person must be prepared to constantly improve their competences – also in adulthood and seniority. The involvement of older people in various forms of education, including lifelong learning processes, has become a necessity, as it is an important factor in maintaining and achieving professional successes for this group of people on the labor market. Although the employment rate of older people (aged 55 – 64) in Poland has been systematically growing for many years, it is still one of the lowest among EU countries. In relation to this group, the challenge is not only to keep these people on the labor market, but also to make better use of their experience.

The involvement of older people in the processes of continuing education is also a very important factor that allows this group of people to remain on the labor market, because low qualifications, lack of skills and the possibility of supplementing them are important reasons why employees in Poland are relatively early excluded from the labor market, compared to other countries. The process of improving the qualifications of adults in Poland is still selective and has a relatively small scope (Table 3).

Another positive phenomenon was the increase in language competences of the population in Poland, including the rural population, which is one of the factors conditioning the development of human capital, the role of which is constantly growing, also in rural areas, along with the progressive globalization of information, work, science and culture. These skills also affect a higher level of employee mobility. Knowledge of foreign languages in the modern world is not only an important indicator of the level of competence and skills of the population, but also enables relatively easy acquisition of a lot of available information, its processing and its use. Foreign languages are taught in primary schools as a compulsory subject. During Poland's membership in the EU, the percentage of children learning English more than doubled. Currently, practically all children learn this language in schools. At later stages of education, learning foreign languages is still compulsory. As a result, adults should know at least one or two languages relatively well. According to data from the Central Statistical Office, in 2022, knowledge of foreign languages was declared by 67.1% of the population in rural areas, and in cities by 76.8% of people aged 18 – 69.

Table 3. Adult education for people aged 25 – 64 in 2004 – 2022

Specification	2004	2010	2015	2022
In %				
Poland	*	5,2	3,5	7,6
including women	*	5,7	3,8	8,3
European Union	*	9,1	10,7	11,9
including women	*	10,0	11,7	12,9

** no data*

Source: GUS 2019, 2021a, 2023a

In rural areas, 45.9% knew one language. In cities, this percentage was at the same level. Two or more languages were known by every fifth rural resident and every third urban resident. However, most people from rural areas had basic language skills, while in cities more people knew foreign languages at higher levels (intermediate and advanced).

The outbreak of the pandemic has highlighted how important the digital competences of society, access to the Internet and the skills of the population in this area are (Table 4).

As a result of several educational activities and the social development of the country's inhabitants, especially in recent years, these skills have developed significantly. In 2022, more than half of the rural population, aged 16-74, sent or received e-mails, made phone calls via the Internet, participated in discussion forums, and read the news. However, in comparison with other EU countries, including those that entered these structures together with Poland, a certain civilizational backwardness of Poles in this area was visible.

In most EU countries, in 2006, about twice as many people than in Poland used e-mail or searched for information about products on the Internet or used banking services, and in comparison, to the Scandinavian countries, there were three times fewer such people in Poland. After almost twenty years, Poles are still below the average for the EU-27 countries in this respect, and the differences with respect to the leaders in this area have persisted. Therefore, accelerating the development of society's competences in this area to achieve a similar level with the country’s leadership in this area of skills has become an important challenge for the coming years.

Table 4. Percentage of the population aged 16 – 74 using the Internet in the years 2005 – 2023 by purpose of use for private use and place of residence (in %)

Rural areas			Urban areas		
2005	2015	2023	2005	2015	2023
Using email					
13,0	42,8	58,5	31,0	60,8	80,5
Phone calls over the Internet, videoconferencing					
3,8	21,1	49,6	9,0	31,6	66,2
Social networking sites/participation in chats, discussion forums					
13,2	37,8	59,7	22,8	43,6	68,2
Searching for information about goods or services					
10,0	36,6	71,5*	20,3	45,7	76,1*
Purchase of goods and services					
2,0	17,0	58,7	8,0	28,4	73,8
Using banking services					
2,0	19,7	49,6*	8,0	38,2	59,6*
Using public administration services					
6,0	17,1	48,1*	16,0	32,3	60,3*
Searching for health information					
2,0	20,5	46,4*	10,0	33,1	55,8*

** 2022*

Source: GUS 2009, 2022b, 2023b.

Summary
The aim of the article was to analyze the demographic potential in rural areas, the level of formal education of rural residents, including issues related to adult education and digital competences of the rural population compared to city dwellers. In relation to the age structure of the inhabitants, in the period under study (2003 – 2023), rural areas were characterized by relatively better indicators than cities. In both communities, there was an annual decrease in the population in the age group of children and youth and the population of mobile productive age, with an increase in the number of people in older age groups. Thus, a very strong trend indicating the aging of society is expressed both by a dynamic increase in the absolute number

of people from the oldest age groups and the share of this group in the entire population. Thus, unfavorable quantitative relationships between older and younger groups of people and the possibility of supporting older generations, reflected in support coefficients: the potential support coefficient and the parental care coefficient, have become significantly visible and intensified**.**

These processes are taking place not only in Poland and concern most countries with a relatively high level of civilization development. Hence, an indispensable challenge is the constant development of forms of support and activation of seniors, aimed at improving their quality of life. Above all, actions for their integration with the environment in the place of residence are important.

One of the conditions for increasing employee productivity and the competitiveness of the Polish economy is an efficient education system. Regardless of increasing the average effects of education, its important task is to effectively equalize the development opportunities of people from different environments and areas. Education is also crucial for equalizing development disparities on a regional scale. The most important challenges and problems in this area include: ensuring that all children have access to early childhood education in kindergartens; individualizing the education process so that it is adapted to the needs of different students and activities to popularize adult education by both improving accessibility and raising awareness of the benefits of lifelong learning.

The outbreak of the pandemic has highlighted the important role that digital technologies and access to the Internet and the skills of the population play in everyday life. Currently, more than half of the population aged 16 – 74 send or receive e-mail messages, make phone calls via the Internet, participate in discussion forums, and read the news. However, it should be considered that the further development of digitalization, including e-services in every field, not only in the education or healthcare system, is inevitable. In the coming decades, new technologies will appear, causing the emergence of new digital divisions and the persistence of e-competence gaps among older generations, raised in times before the rapid dissemination of digital technologies. Therefore, the education system must constantly teach the useful use of new digital technologies at every level.

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THE ROLE OF SMART AGRICULTURE IN EMPOWERING WOMEN FARMERS FOR RURAL DEVELOPMENT: A CASE STUDY OF PRISHTINA MUNICIPALITY, KOSOVO

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Abstract
The Municipality of Prishtina, located in the heart of Kosovo, embodies significant agricultural potential that can be unlocked through innovative practices. Integrating smart agriculture technologies offer a unique opportunity to revolutionize traditional farming methods and empower women farmers as key stakeholders. Women farmers play a crucial role in food production and security but often face challenges such as limited access to resources, technology, and decision-making power. By leveraging smart agriculture solutions tailored to their needs, we can bridge these gaps and create a more inclusive and sustainable agricultural sector. Through precision farming techniques, IoT (Internet of Things) sensors, data analytics, and other cutting-edge technologies, women farmers in Prishtina can enhance productivity, optimize resource management, and reduce environmental impact. These advancements streamline farming operations and provide valuable insights, empowering women farmers to make informed decisions and adapt to changing market dynamics. The adoption of smart agriculture practices not only boosts agricultural productivity but also fosters economic growth, improves livelihoods, and strengthens the resilience of rural communities. Focusing on empowering women farmers through smart agriculture can catalyze a ripple effect, uplifting the entire agricultural ecosystem in Prishtina. This study highlights the transformative potential of smart agriculture in empowering women farmers, driving rural development, and promoting sustainable agricultural practices in the Municipality of Prishtina. It underscores the importance of gender-inclusive approaches in leveraging technology for the betterment of agricultural communities and broader society.
Key words: Smart Agriculture, Empowerment, Women Farmers, Rural Development
JEL codes: Q13, Q17, Q18

Introduction

Smart agriculture, characterized by the integration of technology and innovation into traditional farming practices, holds immense potential in transforming agricultural landscapes worldwide. In particular, the adoption of smart agriculture initia-

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tives plays a pivotal role in empowering women farmers, fostering rural development, and promoting sustainable practices within agricultural communities (FAO, 2012). This paper delves into the significant impact of smart agriculture on empowering women farmers, with a specific focus on the case study of Prishtina Municipality in Kosovo.

Within the context of Kosovo, a country with a rich agricultural heritage and a growing emphasis on rural development, the role of women in agriculture is increasingly recognized as fundamental to the sector's growth and sustainability (Sallahu, S., 2022). Women farmers in Kosovo, particularly those in Prishtina Municipality, face unique challenges and opportunities in their agricultural pursuits, highlighting the importance of exploring innovative approaches such as smart agriculture to enhance their participation and productivity (Sallahu, S, 2023).

The case study of Prishtina Municipality serves as a microcosm of the broader agricultural landscape in Kosovo, offering insights into the specific dynamics, challenges, and opportunities faced by women farmers in the region (Municipality of Prishtina, 2012 – 2022). By examining the implementation of smart agriculture practices within this context, this study aims to shed light on how technological advancements and innovative strategies can empower women farmers, drive rural development, and contribute to the overall sustainability of agricultural systems (Subhrajit, M., et al, 2024).

Through a comprehensive analysis of the role of smart agriculture in empowering women farmers in Prishtina Municipality, this paper seeks to not only contribute to the existing body of knowledge on agricultural development but also provide practical insights and recommendations for policymakers, practitioners, and stakeholders in the agricultural sector. By exploring the intersection of gender empowerment, technology, and rural development, this research endeavors to showcase the transformative potential of smart agriculture in fostering inclusive and sustainable agricultural practices in Kosovo and beyond (Gjokaj, 2015).

Literature review

In conducting a comprehensive literature review on the role of smart agriculture in empowering women farmers, it is essential to explore the multifaceted ways in which technological advancements can enhance gender equality, economic opportunities, and sustainable agricultural practices. Research in this field highlights the transformative potential of smart agriculture in addressing the specific challenges faced by women farmers and promoting their active participation in agricultural development.

Numerous studies have underscored the positive impact of smart agriculture technologies, such as precision farming, IoT devices, and data analytics, in improving productivity, resource management, and decision-making processes for women farmers (Vijendra Kumar, et al, 2024). These technologies not only streamline agricultural operations but also provide women with access to valuable information, market linkages, and financial services, thereby empowering them to make informed choices and increase their incomes.

Furthermore, the literature emphasizes the importance of tailored interventions and capacity-building programs that cater to the unique needs and priorities of women farmers. By integrating gender-sensitive approaches into smart agriculture initiatives, stakeholders can ensure that women have equal opportunities to benefit from technological innovations, training programs, and support services, ultimately enhancing their resilience, autonomy, and leadership in the agricultural sector.

Collaborative efforts involving government agencies, NGOs, research institutions, and private sector partners play a pivotal role in promoting gender-responsive smart agriculture policies and programs. By fostering partnerships that prioritize women's participation, knowledge sharing, and skill development, stakeholders can create an enabling environment for women farmers to leverage smart technologies effectively, overcome barriers, and contribute to sustainable agricultural development (Elizabeth Bryan, et al, 2024).

The role of smart agriculture in empowering women farmers highlights the transformative potential of technology in advancing gender equality, economic empowerment, and sustainable agriculture (Susanne Padel, et al, 2022). By synthesizing empirical evidence, best practices, and policy recommendations, this review aims to inform future interventions, research agendas, and advocacy efforts aimed at promoting women's empowerment in agriculture through smart agricultural innovations (Susanne Padel, et al, 2022).

Methodology of the Study

The methodology employed plays a crucial role in understanding the impact of smart agriculture on women empowerment in rural settings. The methodology used in this case study encompasses various key elements, including data collection methods, sample selection criteria, and analytical tools utilized to gather and analyze information effectively.

For data collection, a mixed-method approach was adopted to ensure a comprehensive understanding of the subject. This approach involved both quantitative and qualitative data collection methods. Quantitative data have been gathered through surveys to collect statistical information on factors such as technology adoption rates, income levels, and agricultural productivity among women farmers in Prishtina Municipality. On the other hand, qualitative data collection methods like interviews, focus group discussions have been used to delve deeper into the experiences, challenges, and perspectives of women farmers regarding smart agriculture and rural development.

Sample selection criteria in this case study focused on women farmers, men farmers, agri-processors, citizens (buyers), and dealer's vendors within Prishtina Municipality who were actively engaged in agricultural activities and had varying levels of exposure to smart agriculture technologies. The selection process has considered factors such as farming experience, technology access, and willingness to participate in the study. By selecting a diverse sample, the study has captured a range of perspectives and experiences related to smart agriculture and its impact on rural development and women empowerment.

Analytical tools employed in the study have included both qualitative and quantitative analysis techniques. Quantitative data collected through surveys have been analyzed using Excel to identify trends, and patterns in the data. Qualitative data from interviews have been investigated through thematic analysis to extract key themes, insights, and narratives related to the role of smart agriculture in empowering women farmers for rural development in Prishtina Municipality.

By employing a robust methodology that integrates various data collection methods, sample selection criteria, and analytical tools, the study aimed to provide a comprehensive and nuanced exploration of how smart agriculture can empower women farmers and drive rural development in Prishtina Municipality.

According to data from the last census of the Kosovo Statistics Agency in 2014, published in November 2015, it appears that the Municipality of Pristina has 3389 agricultural economies (KAS, 2015).

Table 1. Agricultural Economies in the Municipality of Prishtina

Municipality	Agricultural Economies in Total	
	Number of agricultural economies	The utilized area of agricultural land (ha)
Prishtina	3,389	12975.65

Source: Kosovo Agency of Statistics (KAS, 2015)

With 3,389 agricultural economies, Prishtina showcases a robust agricultural sector, indicating a diverse range of farming activities and a potentially vibrant rural economy. The total utilized agricultural land of 12,975.65 hectares suggests a significant commitment to agriculture, highlighting the importance of farming in the region. However, the relationship between the number of agricultural economies and the land area may suggest a need for better land management practices or consolidation for increased efficiency (KAS, 2015).

The data reflects a significant agricultural footprint in Pristina, which is vital for local food production and employment. However, it also emphasizes the need for

sustainable agricultural practices to balance productivity with environmental considerations. Prishtina's agricultural sector appears to be an essential part of its economy, requiring continued support and development to optimize its potential.
Table 2 provides an overview of the gender distribution among farm owners/managers in the sample. It presents the frequency, percentage, valid percentage, and cumulative percentage for each gender category. The majority of farm owners/managers in the sample are male, accounting for 89% of agricultural economies in the Municipality of Prishtina. Female farm owners/managers make up a smaller proportion, comprising 11% of the total. This table effectively summarizes the gender demographics within the context of farm ownership/management, providing valuable insights into the gender composition of the population as agricultural economies in the Municipality of Prishtina.

Table 2. Gender of the Farm Owner / Manager

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Men	3,016	89	89	89
	Women	373	11	11	11
	Total	3,389	100	100	100

Source: Kosovo Agency of Statistics (KAS, 2015).

The purpose of the research

The objective of this study is to evaluate how the implementation of smart agriculture practices can specifically empower women farmers in the Prishtina Municipality of Kosovo. This research aims to explore how utilizing smart agricultural technologies and methods can enhance the participation of women in agriculture, improve their livelihoods, and contribute to the overall rural development of the region. By focusing on the intersection of smart agriculture, gender empowerment, and rural development, this study seeks to provide insights into the potential benefits and challenges of integrating technology into agriculture to support women farmers in Kosovo.

Sample Plan

The research occupies a stratified sampling approach, wherein data collection is segregated into distinct categories representing components of the sample. These four segments constitute integral elements of the sampling strategy, and the table below illustrates the number of surveys allocated to each respective segment.

Table 3. Sample distribution

No.	Segments	Number of Surveys
1	Farmer women	25
2	Farmer men	25
3	Agri-processors	20
4	Citizens (buyers)	20
5	Dealers/vendors	10

Source: Own compilation

Data collection

Segmented data in the data survey into different groups: Women farmers, male farmers, agro-processors, citizens (buyers) and traders/sellers. Each segment has a specific number of surveys assigned. This type of segmentation allows for a more targeted approach to data collection, providing data from different actors involved in agriculture. By conducting surveys within these specific segments, various perspectives and comments are gathered that are relevant to each group's role in the agricultural sector. This approach provides a more complete understanding of the challenges, needs and opportunities faced by different actors within the agricultural value chain. Segmenting surveys in this way enables comparison of responses and analysis with the specific characteristics and experiences of each group. It also allows for a more focused interpretation of the data collected, leading to more actionable insights and recommendations for empowering women in agriculture and promoting sustainable rural development.

Table 4 provides a breakdown of the completed questionnaires distributed across different segments and villages in the Municipality of Prishtina.

These villages were selected for the survey of respondents because agriculture is more developed. Based on the segmentation of the respondents and the use of the questionnaire for each group, we can conclude that these data bring a complete and diversified overview of the views and needs of the participants in the agricultural sector. Focusing on empowering women in agriculture through smart technology. The results of this study will provide important guidelines and suggestions to advance rural development and improve women's participation in this key sector of the economy.

Table 4. Completed questionnaires by villages in the Municipality of Prishtina

Villages in the Municipality of Prishtina	Completed questionnaires with women and men farmers	Completed questionnaires with agri-processors	Completed questionnaires with Citizens (buyers)	Completed questionnaires with Dealers/vendors
Hajkobillë	4	1	1	1
Marec	2	2	3	2
Barilevë	7	3	3	2
Mramor	2	2	1	1
Nishec	2	1	1	0
Busi	2	2	0	1
Dabishec	2	1	1	0
Prapashticë	3	1	1	1
Radashec	3	1	0	0
Rimanishtë	2	1	0	0
Sharban	3	0	2	0
Siqevë	2	0	2	0
Keqekollë	2	2	1	0
Slivovë	3	0	0	0
Koliq	1	1	1	1
Trudë	2	0	0	0
Vranidoll	3	0	0	0
Llukar	2	1	1	0
Çagllavicë	3	1	2	1

Source: Own compilation

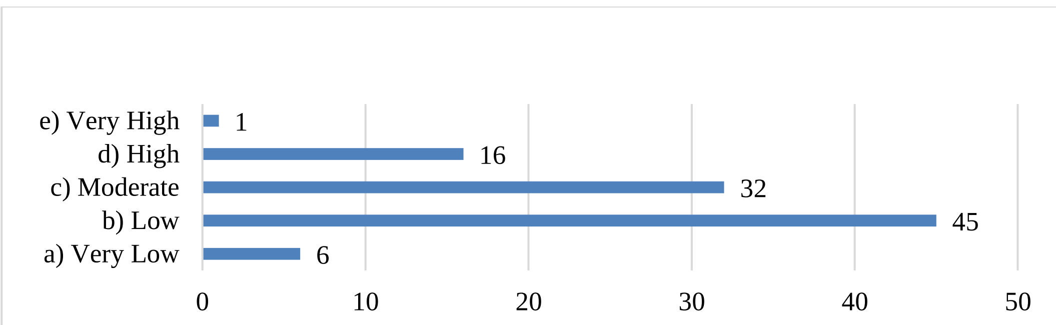

Figure 1. Level of awareness regarding smart agricultural technologies and practices

Source: Own compilation

The responses indicate a general lack of awareness about smart agricultural technologies and practices among the respondents. Here's a breakdown of the results:
Low Awareness: A significant majority (51 respondents) rated their awareness as either "Very Low" or "Low." This suggests that many individuals may not have encountered or engaged with these technologies, highlighting a potential knowledge gap.
Moderate Awareness: With 32 respondents identifying their awareness as "Moderate," there is a portion of the group that has some familiarity but may not be fully informed about the latest advancements or practices. Very High Awareness: Only 17 respondents reported "High" or "Very High" levels of awareness, indicating that the number of individuals well-versed in smart agricultural practices is quite small.
The responses indicate a strong consensus on the importance of technology in enhancing agricultural productivity and sustainability (Figure 2).

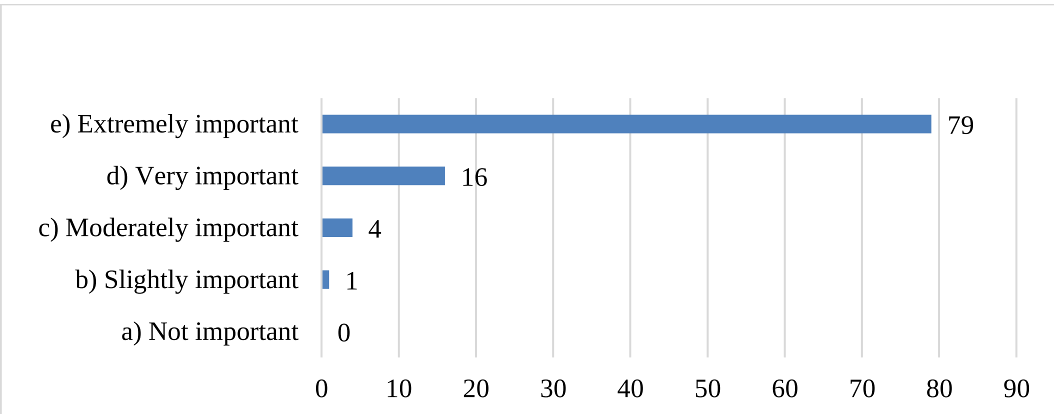

Figure 2. The role of technology in improving agricultural productivity and sustainability

Source: Own compilation

Strong Support: A remarkable 79 respondents (about 82%) believe that technology is "Extremely Important," suggesting a robust recognition of its potential impact in the sector.
Minimal Skepticism: With only one respondent rating it as "Slightly Important" and none selecting "Not Important," there is almost universal agreement on the value of technology.
Moderate to High Importance: The 20 respondents who rated it as "Very Important" or "Moderately Important" further emphasize the overall positive perception.
The results reveal a significant gap in training and support for utilizing smart agriculture tools and techniques among respondents.
Limited Training: Only 19 respondents have received any form of training (4 extensive, 15 some), indicating that access to educational resources on smart agriculture is quite limited.

High Interest in Training: A substantial majority (81 respondents) expressed interest in training, which highlights a strong demand for knowledge and skill development in this area (Figure 3).

The results highlight critical challenges faced by women farmers in the Prishtina Municipality, with a clear emphasis on access to land and resources.

Primary Challenge: A significant majority (54 respondents) identified “Access to land and resources” as the main challenge, indicating a systemic issue that may hinder women’s agricultural productivity and independence (figure 4).

Market Access and Financial Support: The next most cited challenges were “Limited access to markets” (19 respondents) and “Lack of financial support” (22 respondents). This suggests that, in addition to land access, economic factors play a crucial role in the difficulties which women farmers encounter.

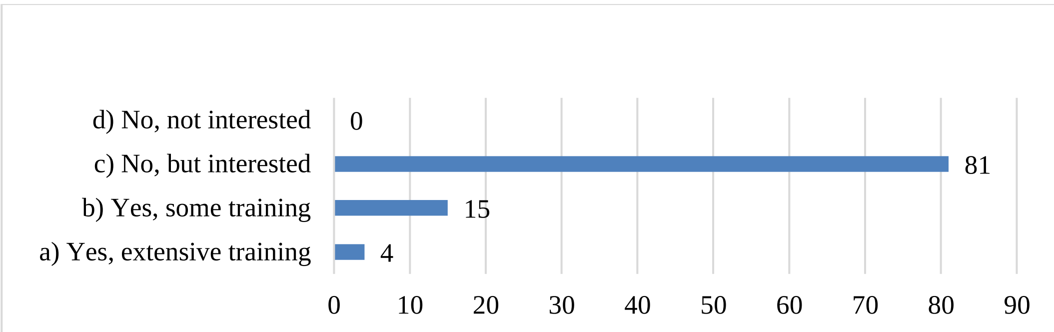

Figure 3. Training or support in utilizing smart agriculture tools and techniques

Source: Own compilation

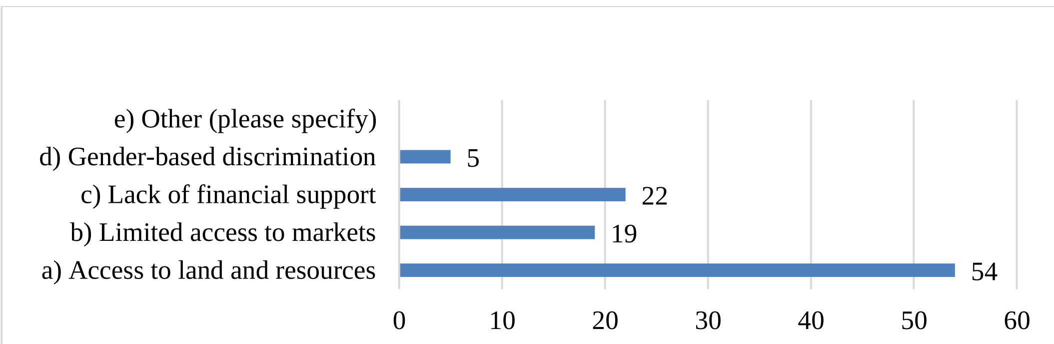

Figure 4. The main challenges faced by women farmers in the Prishtina Municipality

Source: Own compilation

Gender Discrimination: While only 5 respondents noted “Gender-based discrimination,” this still points to underlying social issues that may exacerbate the challenges mentioned.
The responses indicate a strong belief in the potential of smart agriculture to empower women farmers and address the challenges they face.
Widespread Confidence: A majority (81 respondents) selected “All of the above,” demonstrating a comprehensive understanding of how smart agriculture can tackle multiple issues simultaneously, including productivity, efficiency, decision-making, and market access.
Focused Benefits (Figure 5): The smaller numbers for specific benefits, such as increasing productivity (12) and improving efficiency (5), suggest that while respondents recognize these aspects, they view the holistic approach of smart agriculture as the most impactful.

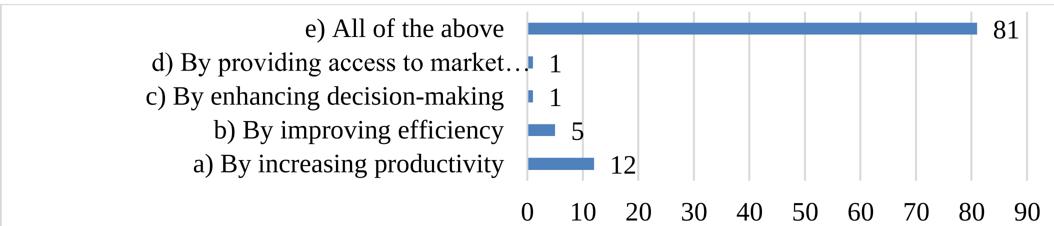

Figure 5. Smart agriculture can help in overcoming these challenges and empowering women in agriculture

Source: Own compilation

Empowerment Potential: This consensus reflects optimism about the role of technology in creating an enabling environment for women in agriculture, potentially leading to greater equity and economic independence.
The results clearly indicate a strong perception of gender disparities in access to resources and opportunities within the farming community.
Significant Recognition of Inequality: 86 respondents noted “significant differences” between male and female farmers, underscoring a widespread acknowledgment of systemic inequalities that may disadvantage women in agriculture. Some Differences: The 11 respondents who observed “some differences” further affirm the notion of inequality, albeit to a lesser extent, suggesting that while some gender parity exists, challenges remain.
Minimal Perception of Equality: Only 3 respondents indicated “no noticeable differences,” which highlights that the vast majority of the community perceives gender-related challenges as prevalent.
The responses strongly indicate that respondents recognize the critical role of gender equality in agriculture for overall rural development.

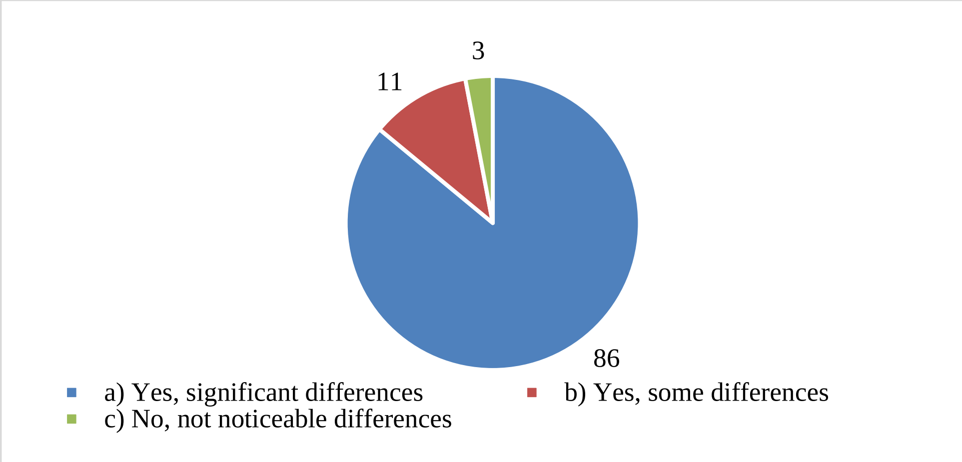

Figure 6. Access of resources and opportunities between men and women farmers in the community

Source: Own compilation

Consensus on Significance: An overwhelming 91 respondents identified "Significant impact," highlighting a broad consensus that gender equality is crucial for advancing rural development in the region (Figure 7).
Minimal Acknowledgment of Lesser Impacts: With only 2 respondents noting "Minimal impact" and none selecting "No impact," it is clear that there is little doubt about the importance of gender equality in this context.
Potential for Growth: The acknowledgment of a "Moderate impact" by 7 respondents suggests that some see a more nuanced relationship, but this is overshadowed by the strong belief in significant benefits.

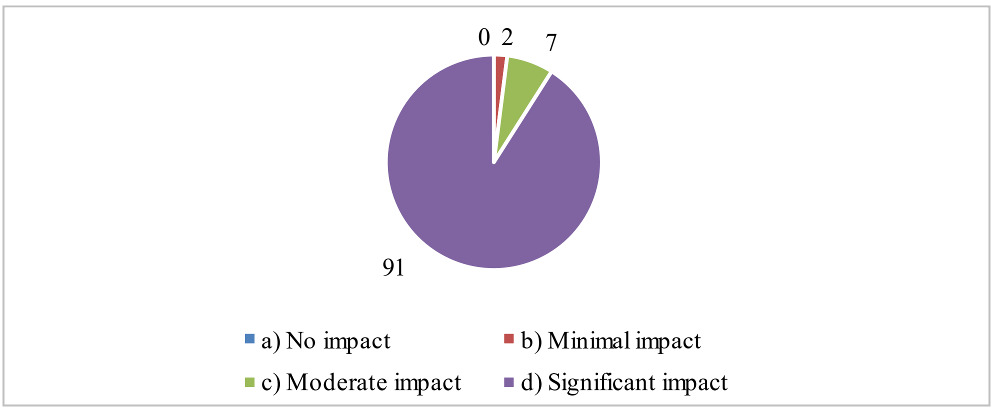

Figure 7. The impact of gender equality in agriculture on the overall rural development of the region?
Source: Own compilation

The responses demonstrate a strong belief in the potential of smart agriculture to enhance income and economic independence for women farmers.
Overwhelming Support: A remarkable 84 respondents (about 88%) “Strongly Agree” that incorporating smart agriculture can lead to increased income, indicating a strong consensus on its positive impact (Figure 8).
Additional Agreement: The 15 respondents who “Agree” further bolster this viewpoint, suggesting that the majority sees the tangible benefits of smart agricultural practices for economic empowerment.

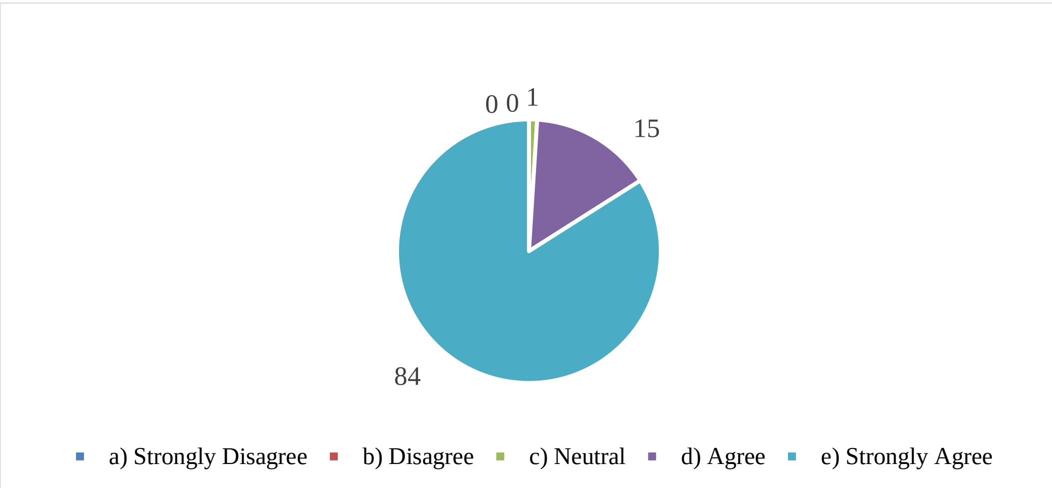

Figure 8. Incorporating smart agriculture can lead to increased income and economic independence for women farmers

Source: Own compilation

Minimal Neutrality: Only 1 respondent remained neutral, while no one expressed disagreement, highlighting a clear, positive outlook on the economic potential of smart agriculture for women.
The responses reflect a robust consensus on the critical importance of involving women in decision-making processes related to agricultural development.
Strong Emphasis on Involvement: An impressive 60 respondents (about 63%) rated this involvement as “Extremely Important,” indicating a widespread belief in the necessity of women's participation for effective agricultural development (Figure 9).

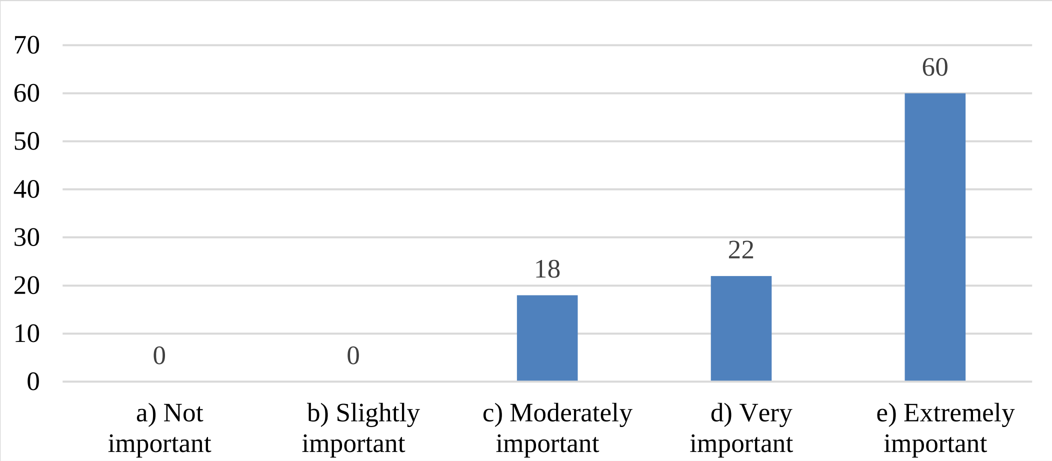

Figure 9. The importance of the involving women in decision-making processes related to agricultural development?

Source: Own compilation

Significant Agreement: With 22 respondents choosing “Very Important” and 18 selecting “Moderately Important,” the data suggests that nearly all participants recognize the value of women's perspectives and contributions in decision-making.
Absence of Disagreement: The lack of responses indicating that women's involvement is “Not important” or “Slightly important” further underscores the strong support for gender inclusion in agricultural policy and practice.
The responses indicate strong expectations regarding the benefits of integrating smart agriculture practices for empowering women farmers in the Prishtina Municipality.
Focus on Sustainable Development: The overwhelming majority (70 respondents) highlighted “Sustainable rural development” as a key benefit, reflecting a strong belief that smart agriculture can contribute to long-term community resilience and resource management.

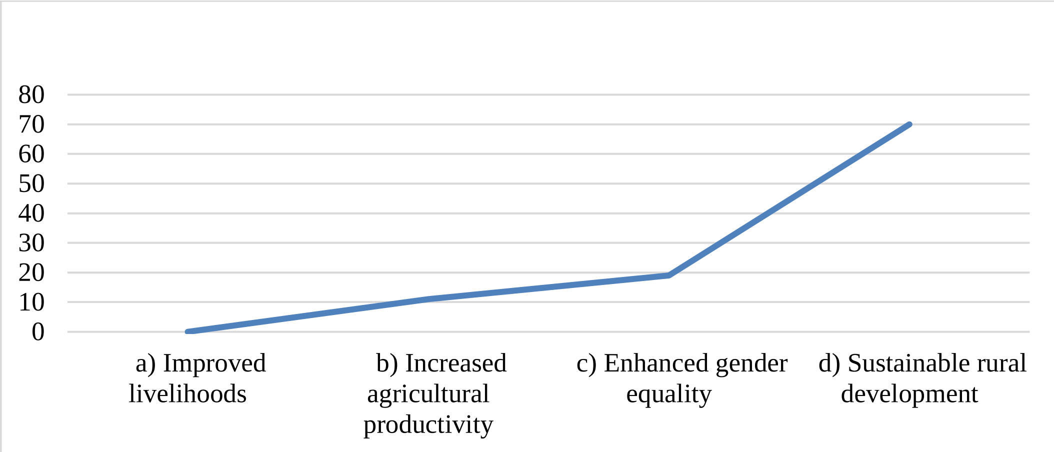

Figure 10. The potential benefits of integrating smart agriculture practices in empowering women farmers in Prishtina Municipality

Source: Own compilation

Recognition of Gender Equality: The 19 respondents who noted "Enhanced gender equality" indicate a significant awareness of the broader social impacts of empowering women through agricultural innovation.

Productivity Gains: While 11 respondents mentioned "Increased agricultural productivity," this suggests that there is also recognition of the direct economic benefits that smart agriculture can provide, although it is less emphasized compared to sustainability.

Absence of Improved Livelihoods: The lack of responses for "Improved livelihoods" may indicate that while the community sees potential benefits, they may view livelihood improvement as a secondary effect of the broader impacts.

Results Discussion and Conclusions

The study results provide valuable insights into the perceptions and experiences of respondents regarding smart agricultural technologies and the empowerment of women farmers in the Prishtina Municipality.

The data reveal a significant gap in awareness regarding smart agricultural technologies, with 51 respondents reporting low levels of familiarity. This indicates a need for educational initiatives to enhance understanding and engagement with these technologies.

Furthermore, while interest in training is high, with 81 respondents expressing a desire for support, only 19 have received any form of training. This highlights an urgent opportunity for targeted capacity-building programs aimed at equipping women farmers with the necessary skills to utilize smart agriculture effectively.

Respondents recognize the importance of technology in improving agricultural productivity and sustainability, with 82% rating its role as “Extremely Important.” This perception underscores the potential of smart agriculture to address current challenges faced by women farmers, such as access to land, markets, and financial resources.

The findings suggest a strong willingness to adopt technological solutions, provided that adequate training and support are made available.

The study highlights significant gender disparities in access to resources and opportunities. 86 respondents observed significant differences between male and female farmers, emphasizing systemic barriers that need to be addressed. The acknowledgment of these disparities is critical, as it points to the need for inclusive policies and practices that promote equity in agricultural development.

Respondents strongly believe in the positive impact of gender equality on rural development, with 91 indicating a “Significant impact.” This reflects a consensus that empowering women in agriculture is not only a matter of equity but also essential for fostering economic growth and social cohesion in rural communities.

When asked about the potential benefits of integrating smart agriculture practices, 70 respondents highlighted the importance of sustainable rural development. This suggests that the community views smart agriculture as a means to achieve broader socio-economic goals, including enhanced gender equality and improved agricultural practices.

Conclusions

The results of this study underscore the critical need for targeted interventions to enhance awareness and training in smart agricultural technologies for women farmers in the Prishtina Municipality. There is a clear recognition of the significant role that gender equality plays in rural development, with strong support for integrating women into decision-making processes and promoting their access to resources.

Investing in education, training, and supportive policies that facilitate the adoption of smart agriculture practices will not only empower women farmers but also contribute to sustainable agricultural development and overall community resilience. These findings present a compelling case for stakeholders to prioritize gender-inclusive strategies in agricultural development initiatives.

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EXPLORING RURAL COMMUNITY ACTIVISM: RURAL WOMEN'S CIRCLES IN POLAND

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Abstract
There is currently a debate in academic research and in the EU forum about the role of social entrepreneurship in rural development. The Rural Women's Circles has been emphasized for its contribution to positive change in the countryside and for preserving the customs and traditions of regions in Poland and Europe for more than 100 years. These organizations work for the benefit of local communities by providing various services, engaging in reintegration, and creating jobs for excluded people. Many of these organizations are active in promoting culture, tradition, tourism, and other social activities in rural areas. A new area of research is emerging, covering social and economic issues, including entrepreneurship and management. This article aims to highlight the significance of Rural Women's Circles in Poland and Europe and to analyze the changes in the number of these entities. The research was conducted in Poland in 2024 using an online survey method (CAWI) and a total of 304 respondents were obtained. They were women (100%), members of rural woman circles. The survey was anonymous and focused on activities undertaken by women in villages and their motivations. The article presents the most important areas of activities of these entities. The activities of village women's circles are usually dictated by an internal need and their action is usually "bottom-up". Self-motivation, friendship, and the desire to help the neighborhood are the main drivers for the establishment of rural women's circles in Poland (and Europe). Today's rural women's circles are formed by young women who are active and united by common goals. This is not only to cultivate traditions but also to develop the region and self-career. KGWs apply for various projects, thus acquiring funds for the realization of various goals. Directions for further research and research hypotheses formulated based on the literature analysis are also presented. The conclusions presented in this thesis can also become a guideline for other European countries where the rural women's movement is still in its infancy.
Key words: rural women, entrepreneurship, social activities, rural areas
JEL code: P25, P32

Introduction

Rural Women's Circles (KGWs) in Poland have a very long tradition dating back to the 19th century. These organizations primarily bring together women residing in rural areas, although it is not uncommon to find men among their ranks. KGWs undertake social, cultural, and educational initiatives. The first organizations of this type were established as early as 1877, initiated by Maria Konopnicka, a Polish novelist, social activist, and an important figure in Polish literature. The goal of these organizations was to improve living standards in the countryside, educate

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women, and preserve folk traditions and culture. After World War I, KGWs expanded their activities, organizing courses in cooking, sewing, and housekeeping, and engaging in cultural and social activities. Despite being subordinated to the communist system after World War II, KGWs continued to play a significant role in rural life, organizing cultural events, competitions, and festivals. In the 1960s and 1970s, the number of circles increased significantly and their educational and social activities continued, albeit under strict supervision by the authorities. After the fall of communism in 1989, KGWs regained their independence and started to operate under new rules. However, in the 1990s, their activities faced a crisis due to social and economic changes (Chmielewska, 2021).

Since 2018, there has been a resurgence in the activities of rural women, following the amendment of the Act on Rural Women's Circles on 9 November 2018. This amendment established a formal legal framework for the operation of KGWs, enabling them to register and access various forms of financial support from the government and the EU (*Agency for Restructuring and Modernization of Agriculture*, www.arimr.gov.pl). It can be said that 2018 marked a significant turning point in Poland.

Overall, it is evident that the Rural Women's Circles in Poland are actively engaged in a variety of initiatives. These include the promotion of local traditions and cuisine, the organization of festivals, fairs, and educational courses. The KGWs play a crucial role in uniting rural communities, supporting local traditions, and education (Lis 2022). They also serve as a hub for people to come together and share experiences, thus enhancing the quality of life in rural areas. Through their activities, the Rural Women's Circles strengthen interpersonal connections and help preserve folk culture in Poland (Parzonko, Sieczko 2024).

Methods and results

The paper presents an overview of research analyzing the increase in the number of registered rural women's circles in Poland and the factors that may have contributed to this growth. The research utilized desk research and a literature review, incorporating governmental data from the Agency for Restructuring and Modernization of Agriculture and the Central Statistical Office in Poland, as well as findings from scientific publications based on research conducted in Poland. The primary aim of the study is to assess the impact of rural women's circles on the development of micro-regions. Empirical data was collected through an online survey featuring open and closed questions, as well as questions with a Likert scale. The survey was distributed in 2024 to representatives of rural housewives' circles in Poland, with 304 responses obtained, all from women. The results presented in this article are part of a larger research project focusing on the influence of women on the development of micro-regions in Poland.

The term “rural women's circle” (short KGWs), refers to an independent and self-governing social organization, as defined by the Polish Act on Rural Women's Circles of 2018 (*Journal of Laws 2018*, item 2212). KGWs bring together women (and sometimes men) from rural areas, particularly those who are active and enterprising, such as businesswomen or women involved in local government. The specific activities of each KGW are decided by its members and typically reflect the needs of the local community. KGWs are empowered to undertake economic and social initiatives in rural areas, and they receive financial and organizational support from the state budget (www.prezydent.pl, *Chancellery of the President of the Republic of Poland*).

The number of Rural Women's Circles (KGWs) in Poland has significantly increased in the last 10 years due to key legal changes and financial support. Prior to 2018, the number of KGWs in Poland was small and stable, with no dynamic growth recorded at the time. The 2018 amendment to the Act on Rural Women's Circles provided financial support for registered KGWs, leading to increased activity in many regions (Kuczma 2019). This resulted in the creation of numerous new organizations of this type, and allowed existing informal rural women's circles to legalize their activities. Before 2018, rural housewives' circles mainly operated informally, sometimes with the support of local governments and NGOs. The lack of a uniform register made it difficult to accurately track the number of active KGWs (Szymańska 2022).

After the changes in 2018, there was a significant increase in the number of KGWs in Poland. In that year alone, several thousand new circles were registered. Due to the availability of subsidies and support programs, more and more women decided to establish new KGWs or formalize existing groups. Currently (2020 – 2024), there is a steady growth in the number of KGWs. It is projected that by June 2024, there will be nearly 16,000 registered farmers' circles in Poland. It is estimated that each circle has between a dozen and a few dozen actively participating women. Assuming an average of 10 – 30 members per circle, it can be estimated that the number of women actively engaged in these rural circles in Poland ranges from 300,000 to 800,000 (Table 1). The data presented in Table 1 is approximate. The number of active women may be higher or lower depending on the size and activity of individual groups. Table 1 shows the current number of registered KGWs in Poland, along with an estimate of the number of members. This estimate considers an average of 10 – 20 active persons in one rural women's circle. It's important to note that in many circles, the number of active members exceeds 20 people, and in some cases, even reaches up to 70 members. However, there are also KGWs where the number of active members is as low as 5 – 6.

Table 1. Number of registered Rural Women's Circles in Poland with estimated number of members (access 26.06.2024)

Polish Provinces	Number of registered farmers' clubs	Estimated number of members
Dolnośląskie	669	13380
Kujawsko-Pomorskie	937	18740
Lubelskie	1714	34280
Lubuskie	274	5480
Łódzkie	1340	26800
Małopolskie	1062	21240
Mazowieckie	2144	42880
Opolskie	266	5320
Podkarpackie	1038	20760
Podlaskie	587	11740
Pomorskie	564	11280
Śląskie	471	9420
Świętokrzyskie	937	18740
Warmińsko-Mazurskie	670	13400
Wielkopolskie	2031	40620
Zachodniopomorskie	667	13340
Total	**15371**	**307420**

Source: own elaboration based on National Register of Rural Women's Circles in Poland, Agency for Restructuring and Modernization of Agriculture, www.krkgw.arimr.gov.pl, 1 access 26.06.2024

It is important to understand that each Rural Circle is unique. They have different names, and objectives, operate in different areas and bring together inhabitants of specific villages. In recent years, Poland has introduced additional financial support programs for KGWs, encouraging more groups of women to establish new circles. These programs include subsidies for cultural and educational activities, as well as the promotion of local traditions and products. In 2024, the Polish government has allocated PLN 120 million to support the activities of these social organizations (*Agency for the Restructuring and Modernization of Agriculture*, www.arimr.gov. pl). The amount of support depends on the number of circle members: circles with up to 30 members can receive PLN 8,000, those with 31 to 75 members can apply for PLN 9,000, and the largest circles, with over 75 members, can receive PLN 10,000. These funds are used for various purposes, such as socio-educational, educational and cultural activities, the development of women's entrepreneurship, and the improvement of living and working conditions in the countryside (Zajda 2019).

There is still a lack of reliable data on the subject in other EU countries. Accurate figures on women's organizations in individual EU countries are difficult to obtain because this information is not consistently collected and reported at the EU level. Different countries have different approaches to registering and supporting women's organizations in villages. Some EU countries, like Poland, have a formal registration and subsidy system, while in others, these activities are more informal and supported by local initiatives (*Gender in Agriculture and...*2016). However, it is possible to see general trends and visible effects of the activities undertaken in different countries by such organizations. In Western European countries, such as Italy, Portugal, Spain and Greece, for example, there is a strong tradition of rural women's organizations. In these countries, rural women are often very involved in agriculture, although their numbers are declining due to migration to cities and changes in the structure of agriculture. In Central and Eastern Europe, the role of women in agriculture and the countryside is also becoming more prominent. In countries such as Poland, the Czech Republic, Hungary and Slovakia, rural women are beginning to play an increasingly important role in local communities, including in agribusiness and entrepreneurship. In general, it can be hypothesized that stronger institutional and financial support for this type of initiative across Europe is helping to make rural women more active and promote their role in local communities. Social organizations of this type are gaining importance, especially in rural areas, and should be supported, both financially, organizationally and legally (Johansson, Korkeaoja 1997).

As part of their activities, KGWs engage in economic, commercial, and cultural initiatives. They are involved in handicrafts, cultivation of regional traditions, building regional brands, tourism and agro-tourism, small-scale catering and agri-food processing, and promoting regional traditions and culture. KGWs often operate rentals of household equipment and household help points. They also organize after-school day care centers and offer help with childcare (Zajda 2021). Women from KGWs actively collaborate with other organizations operating in rural areas, such as local governments, voluntary fire brigades, church parishes, schools and kindergartens, agricultural advisory centers, restaurants, community centers, and many others (Olejniczak 2021).

A Rural Women's Circle can be established by a group of at least 10 adults (mainly woman) who permanently reside in a specific village, and the activities of the circle will be focused on that area. To start, the group needs to create a founding committee and operate according to their rules and regulations. The founding committee is responsible for registering the circle in the National Register of Rural

Women's Circles, which is managed by the Agency for the Restructuring and Modernization of Agriculture. Once registered, the circle gains legal recognition (*National Register of Rural Circles*, www.krkgw.arimr.gov.pl).

In a recent research study, 304 women from rural women's circles provided information about their activities through an anonymous online questionnaire. According to Figure 1, cooking, including the cultivation of traditional cuisine and regional recipes, was the most popular activity, with 24.2% of the women's circles being involved. Additionally, 16.2% were engaged in organizing festivals and events in the region, and 12.4% participated in various activities during competitions, festivals, and shows in rural areas (Figure 1).

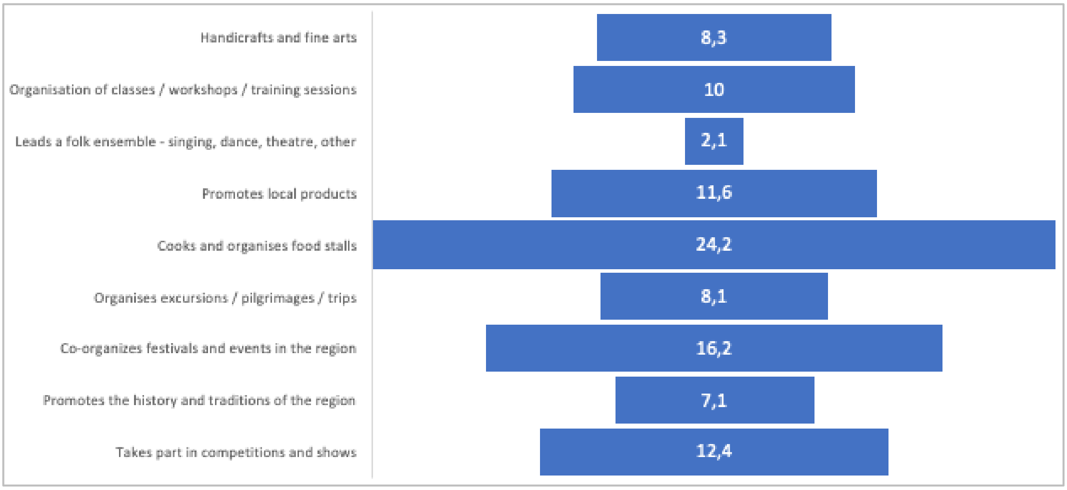

Figure 1. Types of activities carried out by the rural women`s associations participating in the survey (%)

Source: own research conducted in 2024 (n = 304)

In Figure 1, it is evident that the Rural Women's Circles surveyed in Poland are actively engaged in a wide range of activities. These include promoting local products, organizing workshops and training sessions for children, young people, and adults, as well as arranging excursions and study visits for various groups. Additionally, some circles form small theatre groups, run book clubs, and provide support to municipalities with various activities. The strong involvement of women from these circles in village life is apparent, as they not only implement their own initiatives but also support municipal projects.

Conclusions

The number of Rural Women's Circles (KGWs) in Poland has significantly increased over the last five to seven years. Currently, there are more than 15,000 registered KGWs, eager to utilize financial support to enhance social capital in villages. Due to amendments in the Act on Rural Women's Circles and financial support, activities aimed at integrating local communities, fostering entrepreneurial attitudes, and acquiring new skills have become possible. This indicates that the support measures have catalyzed action. It's worth noting that the support amounts are relatively small, but even such a modest boost can inspire significant action, motivating people to take initiative and develop their projects using their knowledge, skills, and entrepreneurship. These initiatives operate on a “snowball” principle – starting with small support and culminating in substantial and lasting changes in the communities where they are implemented. They help integrate the community, provide motivation, and even introduce an element of competition, which encourages people to act.

After conducting research and analyzing foundational data, several factors contributing to the emergence of many rural women's circles in Poland in recent years have been identified:

- KGWs (Cultural and Educational Associations) have always played an important role in integrating rural communities, serving as a place for meetings, exchange of experiences, joint activities, and mutual assistance. Their activities have always focused on strengthening social ties and fostering a sense of community,
- The KGWs have played a crucial role in preserving and promoting folk traditions through organizing and running various cultural events, festivals, exhibitions, and competitions. These activities aim to nurture local customs, handicrafts, music, and folk dance, ensuring that these traditions are passed on from generation to generation.

The necessity to rejuvenate rural areas is underscored by the lack of social integration in villages. The quality of life in these areas is evolving, largely due to the proactive efforts of the younger, educated generation, who are adept in foreign languages. Their engagement in writing projects, acquiring new skills, and traveling within Poland and abroad is contributing to the enhancement of rural life. The 2018 legal amendment has facilitated these groups in obtaining financial support and legal assistance, thus enabling them to pursue their initiatives and projects more effectively.

In conclusion, the rural women's movement in Poland is on the brink of growth. This is fueled by a new, younger, and educated generation who wish to travel, bond with others, and make a positive impact on their surroundings. Additionally, there is a strong determination to uphold regional traditions among both the older and younger generations. Increased financial support and promotion of such initiatives in rural areas will be vital in accomplishing these objectives.

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ANALYSIS OF FOREIGN TRADE WITH CEREALS IN THE EUROPEAN UNION IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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Abstract
In the last period the grain market in the European Union has been tested, the invasion of Russia in Ukraine has affected foreign grain trade in various ways. Ukraine is one of the largest producers of cereals and oleaginous seeds, with the invasion of Russia, the ports of Ukraine on the Black Sea were blocked, it had to be a land alternative, being the majority of cereals produced by Ukraine, through the countries of Poland, Slovakia, Hungary and Romania (all being EU member states with relevant agricultural activity). In the study carried out, the foreign trade with cereals in the European Union will be analyzed in the context of sustainable development, imports, exports and the trade balance of cereals will be analyzed in the context of an agriculture that tends from year to year to be more sustainable, more sustainable with environment. Recently, in the European Union, most agricultural holdings have taken important steps to become more sustainable, they have made investments in the latest generation technologies to reduce the degree of chemistry as well as to reduce the consumption of fossil fuels. Through the analysis carried out, it is desired to provide an overview of foreign grain trade in the wake of the emerging imbalances, but also in the context of sustainable development. Globally, in 2023 – 2024 world grain trade is forecast to decline by around 1.8% from 2022 – 2023, with export forecasts increasing for Turkey and Ukraine, but weaker export prospects for the European Union. This paper aims to analyze the external trade in cereals in the European Union in the period 2004 – 2023, a period of many legislative and operational changes in the agricultural sector in the European Union. The external trade (which includes the value of imports, exports and the trade balance) will be correlated with a number of agricultural indicators such as chemical fertilizer consumption, greenhouse gas emissions and certified organic areas in order to observe the state of EU agriculture in the context of the transition towards sustainable agriculture by reducing the use of chemical fertilizers.
Key words: import, export, trade balance, sustainable development, cereals
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Introduction

Achieving the goals of the global sustainability agenda requires a fundamental transformation of agri-food systems to restore food security, healthy ecosystems and healthy food for future generations (Zinngrebe, 2024).

The European Green Pact, through its Farm to Fork (F2F) strategy, has as its main objective the transition to sustainable agriculture by minimizing chemicalization and agricultural practices with significant negative environmental impacts (Pedersen

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et al.,2024). Specifically, the main F2F targets to be achieved by 2030, which have particular applicability to cereal crops, are: a 50% reduction in pesticide use; a reduction of up to 50% in soil nutrient loss, thereby aiming to reduce soil degradation; a 20% reduction in chemical fertilizers; and an increase to 25% in the total agricultural area devoted to organic farming (Wesseler, 2022).

Producing organic food today is a real challenge, in the context of a growing global population, practicing organic agriculture with low yields and high prices will increase the risk of not ensuring food security and food safety (Eliasson et al., 2022). It is estimated that by the year 2050 the global population will reach 9.7 billion, which calls for a transformation of the agricultural sector, re-establishing higher yields that can sustain a growing population through environmentally friendly agricultural practices (Erekalo et al., 2024).

In the European Union, cereals are grown on half of all active farms, accounting for one third of the agricultural area and a quarter of the value of crop production in the European Union. Worldwide, cereals produced in the European Union account for approximately 20% of the total value of production, and are used mainly for animal feed and human consumption. Wheat and rye are used roughly equally for animal feed and human consumption, whereas maize, barley, sorghum, and triticale are used exclusively for animal feed (Schils et al., 2018). An analysis by the FAO shows that the annual demand for cereals, including both food and non-food consumption, is expected to increase from 2.1 gigatons in 2006 to 3 gigatons in 2050. The increase will be driven by developing countries' consumption through increased cereal imports, with the European Union having the chance to maintain or increase its share of the global cereal trade. Increasing yields will rely mainly on the use of nitrogen and other chemical inputs, with the intensification of the concept of sustainable agriculture being hampered by the lack of open management towards such development, the fear of possible much lower yields per hectare, and in the context of a growing world population that requires food security (Ittersum, 2013).

In the literature according to some studies conducted in the field, a country can face certain challenges in the international market in the context of semi-innovative exports of goods and services (Arghiroiu, 2015). The paper started with the literature review which is very vast, the research topic is often analyzed and highlighted in numerous research studies. For example, in the search engine ScienceDirect for “foreign grain trade” returned 6,100 results, and for “sustainable development” returned over 1 million results. These topics are heterogeneously dispersed across various scientific publications, the authors have generally focused on analyzing foreign trade in various areas but also on environmental sustainability through various practices and methods.

Materials and methods

To analyze external trade in cereals in the context of sustainable development, data series from EUROSTAT, INTERNATIONAL TRADE CENTRE (ITC) and FAO-STAT were analyzed.

In the results part, a quantitative analysis of the external trade in cereals in the European Union in the period 2004 – 2023 was carried out. The analysis consisted in extracting from the ITC data for each EU Member State the value of imports, exports and trade balance.

Next, a quantitative analysis was carried out of a series of agricultural indicators whose evolution or regression may have an impact on the external trade in cereals in the European Union, in the sense that agricultural production may fall and cereal imports may exceed exports, generating a negative trade balance. It has been considered that intensive farming is currently practiced in the European Union, with high productivity based on the use of chemical fertilizers and pesticides but also through a high degree of mechanization (Bais-Moleman, 2019).

Cereal foreign trade

Agriculture is a major sector in the European Union, with a focus on achieving food security by increasing agricultural production in a way that minimizes environmental damage. The European Union is a major producer of cereals and plays an important role at world level, with the EU expected to become the world's largest wheat producer by 2032, overtaking China (OECD-FAO, 2023). The following table will analyze the trend in cereal production in the period 2011 – 2022:

In the graph (Figure 1) we analyzed the cereal production in the period 2011 – 2022 of the European Union where we can observe a fluctuation in production in the analyzed period due to climatic conditions. It is observed that in 2022 cereal production is approximately equal to that of 2011 but there is a decrease by 9% compared to 2021. The year 2022 was a challenging year for the European Union agriculture, the main Member States with significant agricultural activity were affected by drought and numerous uncertainties caused by the Russian invasion of Ukraine. The best agricultural year in terms of overall agricultural production in the period under review was 2014, reaching a production of about 307 million tons, up by 6.8% compared to 2013. The average cereal production in the period under review is about 284 million tons.

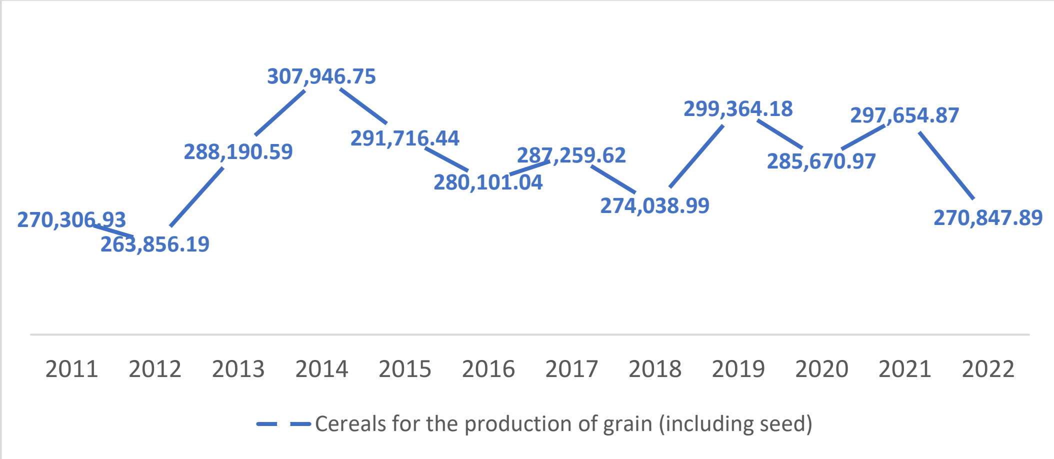

Figure 1. Cereals for the production of grain (1000 tons)

Source: EUROSTAT, edited by the authors

Imports of cereals in European Union

After Russia's invasion of Ukraine in 2022, the European Union eliminated tariffs on Ukrainian grain imports, which led to an oversupply on the EU market. Ukraine being a large producer of cereals, faced problems in exporting its products due to the blockade imposed by Russia in the Black Sea ports (Urak, 2024). The situation has made the EU an accessible transitional export route for Ukrainian grain exports destined mainly for Africa and the Middle East (Fernandes, 2023). After the Russian invasion the EU facilitated the transition of more than 44 million tons of grain via land and river routes, these measures affected the EU domestic grain markets. In 2023 there were numerous protests about the lack of measures to limit Ukrainian grain exports which exponentially affected the EU domestic grain market by significantly reducing grain prices and increasing stocks (Devadoss, 2024). In the following we will analyze the value of grain imports per EU member state and the total value of imports at the global level. At the European level, of interest are the years 2020 and 2023, the period of significant and impactful changes in cereal imports into the Union.

During the analyzed period there is an increase in grain imports by 371%, with a major intensification in the period 2020 – 2023, when Russia invaded Ukraine, which led to the blockade of Ukrainian ports and the inability to trade grain through its own ports. Ukraine chose alternative methods, so that Ukrainian grain transited some EU member countries (e.g. Romania, Poland, Slovakia, etc.) and led to increased imports from the EU. It can be observed that in 2023 the value of EU imports accounted for 18.75% of the total value of world cereal imports, with a slight decrease compared to 2004, when the share of EU imports in total world imports was 19.87%, the decrease may be influenced by the increased productivity of EU farms, which are able to produce the seeded quantities of cereals that are able to cover the consumption needs.

Table 1. Imports of cereals in European Union (euro thousand)

Importers	2004	2010	2016	2020	2023
World	41.388.051	68.591.408	94.665.650	114.017.890	162.886.463
European Union (EU 27)	8.224.033	12.217.610	16.786.900	19.272.923	30.539.791
Austria	119.993	263.129	430.897	531.419	726.390
Belgium	883.726	1.260.417	1.787.105	1.955.357	2.560.217
Bulgaria	58.397	53.764	62.649	94.028	159.582
Croatia	42.850	23.530	45.023	72.034	154.346
Cyprus	72.498	93.800	92.780	101.819	159.029
Czech Republic	39.489	80.136	130.610	164.616	259.374
Denmark	144.103	169.933	171.516	174.036	228.920
Estonia	17.144	14.449	14.835	18.211	33.405
Finland	42.355	28.871	27.925	35.318	67.212
France	467.283	693.726	901.194	928.025	1.126.059
Germany	723.299	1.784.802	2.461.279	2.956.418	4.192.378
Greece	299.220	312.659	361.394	362.683	528.795
Hungary	72.974	84.282	173.110	202.673	525.245
Ireland	118.496	178.655	252.071	391.377	540.162
Italy	1.638.456	2.042.872	2.811.206	3.156.747	5.291.163
Latvia	12.571	76.493	124.220	193.513	330.619
Lithuania	19.678	38.118	44.673	105.375	181.411
Luxembourg	17.296	22.408	40.320	51.204	72.225
Malta	15.091	22.729	29.013	21.607	34.431
Netherlands	1.168.173	1.776.203	2.266.540	2.825.510	3.736.433
Poland	179.676	245.760	322.080	484.633	716.448
Portugal	491.816	638.475	737.174	772.074	1.338.797
Romania	219.887	239.851	596.449	704.701	701.168
Slovakia	26.907	109.674	77.387	93.156	193.388
Slovenia	63.988	56.306	66.539	77.963	138.925
Spain	1.208.543	1.804.604	2.632.722	2.671.334	6.356.200
Sweden	60.124	101.963	126.192	127.092	187.469

Source: Edited by the authors based on ITC data

Spain, with a population of 48 million and the second largest country in the European Union in terms of surface area, is the world's top cereal importer. This registers an increase in imports between 2004 and 2023 of 526%, with the value of imports increasing sharply in 2023, a year in which the cereal harvest was very poor in the context of the drought that affected the country, and they manage to cover their cereal consumption needs through imports. Italy is the second country in terms of the value of cereal imports, registering an increase of 323% in the period analyzed, a country that is a large consumer of cereals but with medium cereal production possibilities, so that the cereal needs for consumption are met by imports.

Romania records a 319% increase in imports in the analyzed period, with the value of imports in 2023 remaining approximately constant compared to imports in 2020, Romania occupying an important place in terms of cereal cultivation in the European Union, which manages to ensure its own consumption from its own production.

In the context of a transition towards sustainable agriculture, the value of cereal imports into the European Union is expected to increase as a result of the reduction in the use of chemical fertilizers.

The European Union is expected to become the world's biggest wheat importer by 2024, according to the USDA.

Exports of cereals in European Union

The cereals trade currently accounts for about 17% of global consumption. Globally, it is known that America and Europe are trading cereals produced in Asia and Africa, where there is a growing demand for food and feed due to population growth and the expansion of livestock sectors at a faster pace than domestic production. This growth trend is expected to continue over the next decade, with cereal exports increasing by 11% from the reference period to 2032 (OECD-FAO, 2023). In the following, cereal exports by each EU Member State and the value of total world exports are analyzed (Table 2).

Over the period 2004 – 2023, EU cereal exports increased by 416%, influenced by a slight increase in cereal production but also by a concomitant increase in imports, so that EU cereals are destined for Asia and domestic consumption is provided by imports from Ukraine and other countries.

In 2023, EU cereal exports account for about 21% of total world cereal exports, roughly the same share as in 2004 and down by about 2% compared to 2010 and by 1% compared to 2020.

The first place in terms of exports is occupied by France, which exported in 2023 cereals worth 7,634,148 thousand euro, registering an increase in the period analyzed by 93%, France being a country with high agricultural potential, it is ranked first in terms of cereal cultivation, technical plants, livestock breeding and viticulture. France has an agricultural area of about 30 million hectares, of which arable land accounts for about 18.5 million hectares. During the period under review, a decline in cereal exports can be observed between 2010 and 2016, when there is a slight decrease of 1%.

Table 2. Export of cereals in European Union (euro thousand)

Exporters	2004	2010	2016	2020	2023
World	36.392.126	63.749.663	87.126.837	104.533.553	150.824.103
European Union (EU 27)	7.523.420	14.747.083	19.235.767	23.245.787	31.267.016
Austria	168.511	268.476	376.152	462.481	618.968
Belgium	327.429	411.585	516.221	570.757	602.301
Bulgaria	119.117	547.328	1.030.756	1.169.832	2.127.606
Croatia	6.610	83.994	149.903	321.776	377.003
Cyprus	6	185	107	126	161
Czech Republic	50.460	300.286	603.219	612.994	931.859
Denmark	131.528	411.310	304.291	316.539	466.803
Estonia	827	34.631	106.204	214.063	219.367
Finland	53.968	105.029	118.821	140.456	125.810
France	3.936.845	5.781.920	5.618.399	6.824.817	7.634.148
Germany	1.076.877	2.126.431	2.568.238	2.627.337	3.186.781
Greece	40.561	157.147	200.454	146.763	279.658
Hungary	365.256	1.100.825	1.188.793	1.602.888	1.698.211
Ireland	13.547	22.258	16.358	39.638	62.941
Italy	392.841	649.359	703.739	729.187	1.083.515
Latvia	10.707	211.690	403.383	650.290	791.682
Lithuania	72.819	240.101	593.895	982.158	1.125.501
Luxembourg	7.563	12.841	15.124	16.998	22.305
Malta	6	4.024	5.438	4	2.340
Netherlands	164.801	297.727	441.090	569.894	617.691
Poland	36.192	305.744	1.051.105	1.709.653	3.559.987
Portugal	38.235	34.219	63.792	85.616	197.961
Romania	43.879	882.573	2.102.202	2.143.536	4.124.785
Slovakia	41.576	198.036	350.347	405.565	647.670
Slovenia	2.386	19.361	34.816	71.078	76.464
Spain	286.916	366.798	362.669	484.849	419.563
Sweden	133.958	173.208	310.251	346.491	265.933

Source: Edited by the authors based on ITC data

In second place in terms of cereal exports is Romania, a country with high potential in terms of cereal cultivation, in 2023 it exported cereals worth 4,124,785 thousand euros, the value of exports recorded an impressive increase in the period analyzed of about 94 times compared to 2004. In Romania, agriculture is recording an increase in productivity, with farms recording much higher yields per hectare, which has been made possible by major investments in agricultural technology and an increase in the degree of chemicalization, with farmers investing more and more in a hectare of cultivated land.

In third place is Poland, with the value of exports in 2023 increasing by about 98 times compared to 2004, the increase being mainly influenced by improved yields per harvested hectare but also by an increase in the value of cereal imports, as they choose to sell their grain to other countries and import cereals to cover domestic consumption.

The countries in the bottom three for cereal exports are Cyprus, Malta and Luxembourg, where agriculture is not a core activity due to very small areas of arable land and climatic conditions unsuitable for farming.

Trade balance of cereals in European Union

The European Union is recognized worldwide for its competitiveness, quality and diversification and remains the world's largest trader of agri-food products. The European Union's main exports were cereal preparations, with the top three export destinations in 2023 being the UK, the USA and China. For EU imports, the top three destinations were: Brazil, the United Kingdom and Ukraine according to the European Commission. The table 2 will present the cereal trade balance from 2004 – 2023 for the European Union (Table 3).

The EU cereals trade balance is in surplus, meaning that the EU manages to export more cereals than it imports. The value of the trade balance is decreasing in 2023, because at EU level wheat imports have increased significantly in recent years, but also because of the increase in imports in 2023 due to the war between Ukraine and Russia. The trade balance recorded negative values in the period analyzed only in 2004, 2007 and 2018. The EU member countries with the largest deficits in the cereals trade balance are Spain, Italy and the Netherlands. The first two countries, Spain and Italy, have an average potential in terms of cereal cultivation, as their agriculture is based on other branches, so that their food security relies on imports, resulting in a net trade deficit. If we look at the Netherlands, domestic consumption is predominantly through imports, as it is a small country in terms of size, with a small arable area, but with a population of around 18 million, this means high cereal imports to achieve food security. It can be observed that the cereal trade balance for the three countries mentioned above is in deficit from 2004 to 2023, they have not even recorded a single year in which exports were higher than imports.

Table 3. Trade balance of cereals in European Union (euro thousand)

Trade balance	2004	2010	2016	2020	2023
World	–4.995.925	–4.841.745	–7.538.813	–9.484.337	–12.062.360
European Union (EU 27)	–700.613	2.529.474	2.448.866	3.972.863	727.224
Austria	48.518	5.348	–54.745	–68.938	–107.422
Belgium	–556.297	–848.832	–1.270.884	–1.384.600	–1.957.916
Bulgaria	60.719	493.564	968.108	1.075.804	1.968.024
Croatia	–36.240	60.464	104.880	249.743	222.657
Cyprus	–72.492	–93.615	–92.673	–101.693	–158.868
Czech Republic	10.971	220.150	472.609	448.378	672.485
Denmark	–12.575	241.377	132.775	142.503	237.883
Estonia	–16.317	20.182	91.369	195.852	185.963
Finland	11.613	76.158	90.897	105.138	58.598
France	3.469.562	5.088.194	4.717.205	5.896.792	6.508.088
Germany	353.578	341.628	106.959	–329.081	–1.005.597
Greece	–258.659	–155.512	–160.940	–215.919	–249.137
Hungary	292.282	1.016.543	1.015.683	1.400.215	1.172.967
Ireland	–104.949	–156.397	–235.713	–351.740	–477.221
Italy	–1.245.615	–1.393.513	–2.107.467	–2.427.560	–4.207.648
Latvia	–1.864	135.197	279.163	456.778	461.063
Lithuania	53.141	201.983	549.222	876.783	944.090
Luxembourg	–9.733	–9.567	–25.196	–34.206	–49.920
Malta	–15.085	–18.705	–23.575	–21.603	–32.091
Netherlands	–1.003.371	–1.478.476	–1.825.450	–2.255.616	–3.118.742
Poland	–143.485	59.983	729.026	1.225.021	2.843.539
Portugal	–453.581	–604.256	–673.381	–686.458	–1.140.836
Romania	–176.008	642.722	1.505.752	1.438.834	3.423.617
Slovakia	14.668	88.361	272.959	312.410	454.282
Slovenia	–61.602	–36.945	–31.723	–6.885	–62.460
Spain	–921.627	–1.437.805	–2.270.054	–2.186.484	–5.936.637
Sweden	73.834	71.245	184.059	219.398	78.464

Source: Edited by the authors based on ITC data

The cereals trade balance is clearly in surplus in France, Romania and Poland, countries where the value of cereal exports far exceeds the value of imports, as these three EU Member States are the main cereal producing countries in the European Union, with cereal growing being a traditional and basic activity.

Agriculture and environment in European Union
Chemical fertilizers have been a main product for agriculture to increase soil nutrients and have been used since the middle of the last century. By using chemical fertilizers agricultural yields can increase rapidly and efficiently compared to using organic fertilizers. The overuse of chemical fertilizers can cause major environmental problems such as pronounced soil degradation, air pollution (with NO, N_2O, NO_2) as well as groundwater pollution (Zhao, 2024). Agriculture in the European Union is in a continuous process of change, adapting to new changes in sustainable agricultural practices. The concept of 'organic farming' is relatively new in the European space, with most farmers believing that the transition to organic farming will have a negative impact on farms, the main fear being that the lack of chemicalization may affect the yield per hectare.

Nitrous oxide (N_2O) is expected to increase by 9.20% between 2000 – 2021, a gas generated largely by agricultural fertilizers, and has a global warming potential almost 270 times greater than carbon dioxide. Researchers believe that environmental policies can encourage farmers to adopt sustainable nitrogen use practices through various financial incentive programs.

Emissions of methane from agriculture, a greenhouse gas, decreased by 1.68% during the period under review, after an increase of 10.79% between 2000 – 2010, with methane emissions reaching 284.92 kilotons in 2010.

Pesticides used in agriculture show a slight increase of 2.30% over the period under review, as they play an important role in achieving food security and plant health in the European Union. Overuse can affect water, soil and biodiversity. The European Green Pact aims to reduce the use of hazardous pesticides by up to 50% in the European Union by 2030. In the context of increasing cereal consumption, pesticides have become indispensable in maintaining the health of agricultural cereal crops and agricultural cereal yields (Table 4).

The total consumption of nitrogen used in agriculture is decreasing during the period under review by 7.38%, the period under review being 2000 – 2021. However, the consumption per hectare records an increase from 72 kg/hectare in 2000 to 75 kg/hectare in 2021, which is influenced by the fact that part of the agricultural area has become unproductive with the passage of time, thus generating a higher consumption per hectare in 2021 compared to 2000, but remembering that the amount of total nitrogen used is decreasing. Nitrogen is the nutrient applied at the highest rates in agriculture, it needs to be applied rationally by farmers, and research is being re-launched worldwide to establish a set of maximum amounts of nitrogen for each plant species.

Phosphate used in agriculture has decreased by 20.55% over the period under review and is considered one of the most important macro-elements for increasing the yield and quality of agricultural products. The European Union is dependent on phosphorus imports, and over time the price of phosphorus has been affected by various factors (world political situation, world crises, etc.), directly affecting the supply chain in the European Union. It is estimated that global phosphorus resources will be depleted in about 50 years, so in the medium and long-term agriculture will have to replace phosphorus use with other more sustainable products.

Table 4. Agriculture and environment in European Union

Indicators	2000	2005	2010	2015	2021
Emissions N_2O from crops in kiloton (nitrous oxide)	57,9407	58,3569	56,7657	63,5770	63,2966
Emissions CH_4 from crops in kiloton (methane)	257,1740	260,1249	284,9270	266,9496	252,8668
Pesticide use in agriculture (tons)	346.096,63	356.589,17	315.314,73	366.379,41	354.082,26
Nitrogen used in agriculture (tons)	10.144.215 (72 kg/ha)	9.776.639 (73 kg/ha)	9.548.776 (74 kg/ha)	10.337.512 (81 kg/ha)	9.396.404 (75 kg/ha)
Phosphate used in agriculture (tons)	3.314.570 (25 kg/ha)	3.036.975 (24 kg/ha)	2.252.587 (18 kg/ha)	2.471.039 (20 kg/ha)	2.633.736 (22 kg/ha)
Potash used in agriculture (tons)	3.647.603 (27 kg/ha)	3.228.844 (25 kg/ha)	2.592.845 (21 kg/ha)	2.692.461 (21 kg/ha)	2.888.591 (23 kg/ha)
Agriculture area under organic farming (1000 ha)	-	5.554,93	8.333,17	10.654,563	15.707,7692
Agriculture area certified organic (1000 ha)	-	2.316,98	3.632,81	6.956,116	10.391,398
Manure applied to soils (tons)	1.182.305	1.139.055	1.119.636	1.107.473	1.072.867

Source: FAOSTAT, edited by the authors

Potassium used in agriculture is decreasing by 20.81% over the period analyzed, helping plants to grow by accelerating photosynthesis, disease resistance, assimilation of proteins needed for growth and resistance to drought and frost.

The agricultural area under organic farming increased 282.77% between 2005 – 2021, with the increase being more pronounced after 2010, when the concept of organic farming began to gain interest in Europe. In 2022 the area farmed organically accounted for 10.5% of all agricultural land, with the rapid expansion being influenced by the targets set by the European Green Pact. According to EUROSTAT data most of the organic land is used for growing arable crops (e.g. cereals).

The certified organic agricultural area shows an increase of 448.48% in the period 2005 – 2021, in 2021 the certified organic area represents about 66.15% of the total organic cultivated area. The main countries with the majority of certified organic land are Spain, France, Italy and Germany.
Manure applied on soils registers a slight decrease in the period 2000 – 2021 by 9.26%, it is considered as an organic fertilizer and its application in optimal quantities does not pollute the soil, groundwater and ensures optimal plant nutrition and is an important prerequisite for sustainable agriculture.

Conclusions

Producing organic food today is a real challenge, in a context where the world's population is constantly growing, practicing organic agriculture with low yields and high prices will increase the risk of not ensuring food security and food safety.
In the European Union, cereals are grown on half of all active farms, accounting for a third of the agricultural area and a quarter of the value of crop production in the European Union. Worldwide, cereals produced in the European Union account for around 20% of the total value of production, mainly used for animal feed and human consumption, making the European Union a major player in the global cereals trade.
In the period 2004 – 2023, there was a 371% increase in cereal imports, with a major intensification in the period 2020 – 2023, when Russia invaded Ukraine, which led to the blockade of Ukrainian ports and the inability to trade cereals through its own ports.
Over the period 2004 – 2023, EU cereal exports increased by 416%, influenced by a slight increase in cereal production but also by a concomitant increase in imports, so that EU cereals are destined for Asia and domestic consumption is provided by imports from Ukraine and other countries.
The EU cereals trade balance is in surplus, meaning that the EU manages to export more cereals than it imports. The value of the trade balance is decreasing in 2023, because at EU level wheat imports have increased significantly in recent years, but also because of the increase in imports in 2023 due to the war between Ukraine and Russia
Over the period 2000 – 2021, N_2O and CH_4 emissions remain roughly constant broadly influenced by the diversification of agriculture and the increase in agricultural chemicalization.
Pesticides used in agriculture show a slight increase of 2.30% over the period 2000 – 2021, as they play an important role in ensuring food security and plant health in the European Union. The decrease according to the study may be due to the fact that in the EU the area certified organic has increased by 448%.
The consumption of nitrogen, potassium and phosphorus has decreased over the period, indicating that the EU's efforts to move towards sustainable agriculture are beginning to bear fruit.

In conclusion, the concept of sustainable agriculture in the European Union is still in its infancy, with the EU taking important steps to develop this concept by: reducing chemicalization, increasing the area under organic farming, reducing greenhouse gas emissions, and making large-scale use of precision farming. At the same time, sustainable development in agriculture is being sought through the introduction of measures to combat climate change, protect natural resources and improve biodiversity in the European Union.

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THE COMPETITIVENESS OF BAKERY GRAIN MARKET IN ROMANIA AND BULGARIA – A COMPARATIVE ANALYSIS

MOCANU, STELIANA[1]

Abstract
The bakery grain market is an important economic sector of the food industry in Romania and Bulgaria, this product has always been part of the country's traditions. Bread and bakery products are widely consumed in both countries, based on flour obtained from bakery grains. In 2023, the area cultivated with cereals for the production of grain was 1,977.8 thousand hectares in Bulgaria and 5,239.8 thousand hectares in Romania and the harvested production in EU standard humidity was 10,343.5 thousand tons in Bulgaria and 24,007.9 thousand tons in Romania. Competitiveness is a concept used often for the analysis of an agricultural sector, at the macroeconomic level, being in a close relation with food security and international trading activity from that sector. The subject of this study is represented by the analyze of the competitiveness of two categories of bakery grains: wheat and rye, these two being considered the most used grains for the production of bakery products. In this study it was compared the bakery grain market competitiveness from Romania with the one from Bulgaria. The main indicators used for measuring competitiveness, and used also in this study are: bread and bakery products consumption (from 2019 to 2029), sales volume per capita in 2023, area harvested with wheat and rye (from 2018 to 2022), the production of wheat and rye (from 2018 to 2022), indicators related to foreign trade (import, export and trade balance, for the period), and Balassa Index calculated for wheat, and meslin and rye, for the last 15 years. One of the key findings of the study is that the area harvested with wheat and rye remained constant in both countries from 2018 to 2022. During this period, wheat production in Bulgaria increased by 8%, while it decreased by 14% in Romania. Additionally, rye production rose by 0.1% in Bulgaria and by 23.6% in Romania. In the case of wheat and meslin, trade balance is positive for both countries, while in the case of rye trade balance is positive only for 2021-2023 in Bulgaria, in rest being negative for both countries. The export of wheat and meslin on the world market provides a comparative advantage, particularly for Bulgaria, with a Balassa index of 13.8 in 2023, and for Romania, with a Balassa index of 8.70 in the same year. However, the Balassa index for rye indicates that neither Romania nor Bulgaria has a comparative advantage regarding rye.
Keywords: competitiveness, bakery grain, comparative analysis, Romania, Bulgaria
JEL: Q10, Q17

Introduction

In general, competitiveness represents a term with multiple and various meanings as other authors outlined when examined this issue in their paper (Voinescu & Moisoiu, 2015; Lee & Karpova, 2018, Maslova et al., 2019). European Commission (2009) defined competitiveness as the sum of the economic performance of a state taking in consideration the capacity of the state to assure a high standard of life, without affecting the environment and to provide an enough number of jobs. Latruffe (2010)

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defined competitiveness as “the ability to face competition and to be successful when facing competition”, bringing a different point of view compared with the European Commission definition.

Competitiveness can be measured and analyzed on several group of levels like: firms, sectors, regions, national, multinational economies (Peneder, Rammer, 2018) or at micro, meso or macro levels (Maslova et al. 2019).

Efficiency is an indicator determined by the market demand that influence the competitiveness, because the competitive agriculture is based on the efficient managing of farms. (Manevska-Tasevska & Rabinowicz, 2014) and according to Mukhametgaliev et al. (2020), grain industry can be influenced by the market prices, determined by market demand, quality and the volume of market capacities. In their study regarding India’s agri-food products competitiveness, Yadav and Chattopadhyay (2024) identified the world market size, production’s yield, exchange rate, production cost, openness, and export price, as being the factors who influence the most the export competitiveness.

Bakery products represents the last step from the bakery sector (bread, pastries, and muffins), being produced especially from wheat, barley or rye flour. For the analysis of the competitiveness on the bakery grain market in Romania and Bulgaria, the two types of bakery grains wheat and rye were chosen for the present study. These two grains were used for this study, being considered through the most important grains for this sector, cultivated on large lands (Boboc et al., 2019).

Regarding bread and bakery sector, in Europe seems to increase in the following years as it can be seen in the forecast revealed by Statista in Figure 1.

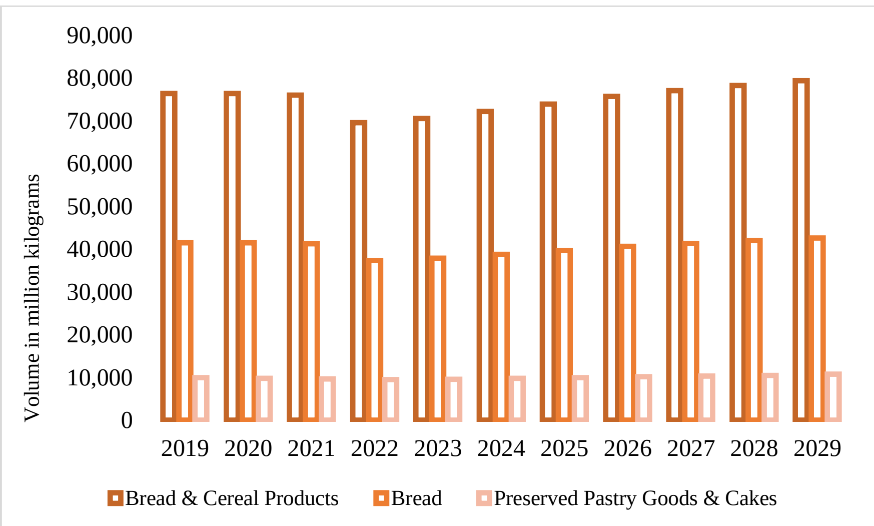

Figure 1. Bread and bakery consumption volume in Europe from 2019 to 2029, by category (in million kilograms)
Source: Statista Consumer Market Insights (Statista, 2024a)

In 2019 the consumption of bread and cereal products in Europe was 76,408.03 thousand tons, the consumption of bread was 41,494.58 thousand tons and the consumption of preserved pastry goods and cakes was 9,965.62 thousand tons. From 2019 to 2024, the consumption decreased with 6% (4,207 thousand tons) for bread and cereal products, 7% (2,721 thousand tons) for bread and with 2% (211 thousand tons) for preserved pastry goods and cakes. However, estimated consumption up to the year 2029 is 79,369.04 thousand tons for bread and cereal products, 42,571.4 thousand tons for bread and 10,723.8 thousand tons for preserved pastry goods and cakes.

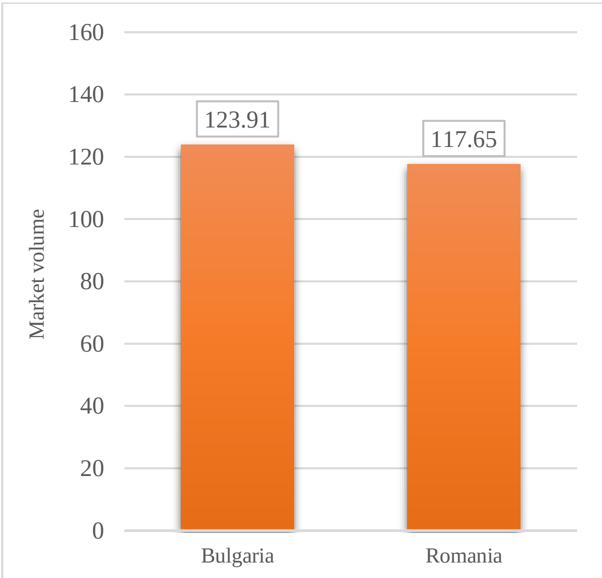

Figure 2. Per-capita volume sales in the bread & bakery products market, in 2023 (in kilograms)

Source: Statista Consumer Market Insights (Statista, 2024b)

In 2023, the sales volume of bread & bakery products per capita was 124 kilograms in Bulgaria and, with 5% less, respective 118 kilograms in Romania, as can be seen in Graphic 2.

Methodological framework

Because wheat and rye are considered one of the most used grains for the production of bakery products, these 2 were the subject of the analysis of all indicators in this study, for the comparative analysis between Romania and Bulgaria.

In the first part of this paper, general indicators available on FAOSTAT are the dynamics of production of wheat and rye in Romania and Bulgaria (for the period 2018 – 2022) measured in tons, area harvested with wheat and rye in Romania and

Bulgaria (for 2018 – 2022) measured in hectares. Foreign trade indicators: imports, exports and trade balance of raw materials for the bakery sector (wheat and meslin and rye categories), for both countries measured in USD thousand, available at Intracen.org for the period 2019 – 2023 indicators analyzed also by Manevska-Tasevska and Rabinowicz (2014) in their studies in order to measure the competitiveness from Romania and Bulgaria were analyzed for an overview of the sector.
In the second part of this study, the Balassa index was analyzed in order to determine the comparative advanced index bakery grains market in Romania vs. the one from Bulgaria, this method being considered one of the most used by researchers (Maslova et al. 2019).
Balassa Index (RCA) (Balassa, 1965) measures normalized export shares relative to exports of the wheat and rye for Romania and Bulgaria as described in the equation (1).

$$RCA_{ij} = (X_{ij} / X_{ik})/(X_{nj}/X_{nk}) \quad (1)$$

Where:
X: export value
i: Romania/Bulgaria
j: wheat/rye
k: all trade goods
n: the world
All of the data taken into consideration for this study were chosen according to the last 5 years available in the queried database.

Results
Indicators representative for the main bakery grains considered in this paper, wheat and rye, were analyzed in order to determine the competitiveness from bakery grain market.

Table 1. Area harvested (hectares) with wheat

	2018	2019	2020	2021	2022	*2022/2018*
Bulgaria	1,212,010	1,198,680	1,200,180	1,206,190	1,206,580	*99.6%*
Romania	2,116,150	2,168,370	2,155,250	2,175,080	2,168,660	*102.5%*

Source: own compilation based on data available on FAOSTAT (FAOSTAT, 2024)

Table 1 shows the evolution of area harvested with wheat in Romania and Bulgaria between 2018 and 2022. In 2018 the area harvested with wheat was 1,212 thousand hectares in Bulgaria and 2,116 thousand hectares in Romania. In 2022 the area harvested with wheat was 1,207 thousand hectares in Bulgaria and 2,169 thousand hectares in Romania.

In the analyzed period, from 2018 to 2022, the area harvested with wheat decreased with 0.4% (5.4 thousand hectares) in Bulgaria and increased with 2.5% (52 thousand hectares) in Romania. During the analyzed period, the area cultivated with wheat in Romania was bigger than the one from Bulgaria with approximatively 80% in all 5 years analyzed, more exactly with 963 thousand hectares in 2022.

Table 2. Area harvested (hectares) with rye

	2018	2019	2020	2021	2022	*2022/2018*
Bulgaria	8,320	6,100	5,350	7,630	8,330	*100.1%*
Romania	10,260	9,360	11,250	12,110	12,680	*123.6%*

Source: own compilation based on data available on FAOSTAT (FAOSTAT, 2024)

Table 2 shows the evolution of area harvested with rye in Romania and Bulgaria between 2018 and 2022. In 2018 the area harvested with rye was 8.3 thousand hectares in Bulgaria and 10.3 thousand hectares in Romania. In 2022 the area harvested with rye was 8.3 thousand hectares in Bulgaria and 12.7 thousand hectares in Romania.
In the analyzed period, from 2018 to 2022, the area harvested with rye increased with 0.1% (10 thousand hectares) in Bulgaria and with 23,6% (2.4 thousand hectares) in Romania. During the analyzed period, the area cultivated with rye in Romania was bigger than the one from Bulgaria with 23% (1.9 thousand hectares) in 2018, 53% (3.2 thousand hectares) in 2019, 110% (5.9 thousand hectares) in 2020, 58.7% (4.5 thousand hectares) in 2021 and with 52,22% (4.4 thousand hectares) in 2022.
Table 3 shows the evolution of wheat production in Romania and Bulgaria between 2018 and 2022. Production of wheat was 5,954 thousand tons in 2018 in Bulgaria and with 4,189 (70.35%) thousand tons more in Romania, respective 10,143 thousand tons. In 2022, the production of wheat in Bulgaria was 6,448 thousand tons and in Romania it was with 2,237 more (34.69%), 8,684 thousand tons.

Table 3. Production (tons) of wheat

	2018	2019	2020	2021	2022	*2022/2018*
Bulgaria	5,954,520	6,319,630	4,847,940	7,342,990	6,447,770	*108.3%*
Romania	10,143,670	10,297,110	6,392,370	10,433,750	8,684,240	*85.6%*

Source: own compilation based on data available on FAOSTAT (FAOSTAT, 2024)

In the analyzed period, from 2018 to 2022, the production of wheat increased with 8.3% (493 thousand tons) in Bulgaria and decreased with 14.4% (1,459 thousand tons) in Romania. During the analyzed period, the production of wheat in Romania was bigger than the one from Bulgaria with 70% (4,189 thousand tons) in 2018, 63% (3,977 thousand tons) in 2019, 32% (1,544 thousand tons) in 2020, 42.09% (3,090 thousand tons) in 2021 and with 35% (2,236 thousand tons) in 2022.

Table 4. Production (tons) of rye

	2018	2019	2020	2021	2022	*2022/2018*
Bulgaria	14,080	12,180	10,010	16,880	17,300	*122.9%*
Romania	28,640	26,180	28,490	35,100	34,850	*121.7%*

Source: own compilation based on data available on FAOSTAT (FAOSTAT, 2024)

Table 4 shows the evolution of rye production in Romania and Bulgaria between 2018 and 2022. Production of rye was 14,080 thousand tons in 2018 in Bulgaria and with 14,560 (103.4%) thousand tons more in Romania, respective 28,640 thousand tons of rye. In 2022, the production of rye in Bulgaria it was 17,300 thousand tons and in Romania it was with 17,550 thousand tons more (101.45%), 34,850.
In the analyzed period, from 2018 to 2022, the production of rye increased with 22.9% (3.2 thousand tons) in Bulgaria and with 21.7% (6.2 thousand tons) in Romania. During the analyzed period, the production of rye in Romania was bigger than the one from Bulgaria with 103% (14 thousand tons) in 2018, 114% (14 thousand tons) in 2019, 185% (18 thousand tons) in 2020, 107% (18 thousand tons) in 2021 and with 101% (18 thousand tons) in 2022.
Recently, the analysis of cereal foreign trade became an important subject for authors due to the geopolitical situation that is present nowadays in the world. For the value of trade balance analysis, data available on Intracen.org (International Trade Centre, 2024) were used, for two categories of bakery grains: wheat and meslin and rye, for both countries, Romania and Bulgaria, for the period 2019 – 2023.
Meslin is a blend of wheat and rye harvested for some ecological farms, used for the production of flour and being very good for the production of bakery products. (Breg et al., 2006)
Table 5 shows the evolution of foreign trade with wheat and meslin in Romania and Bulgaria between 2019 and 2023. In the case of wheat and meslin, the domestic production covers the necessities with wheat from both countries, so the trade balance is positive for the entire analyzed period.

Table 5. Trade balance with wheat and meslin (USD thousand)

Bulgaria						
	2019	2020	2021	2022	2023	2023/2018
Import	14,465	9,410	18,396	2,4214	24,189	167%
Export	946,988	699,212	1,336,693	1,453,475	1,682,418	178%
Trade balance	932,523	689,802	1,318,297	1,429,261	1,658,229	178%
Romania						
	2019	2020	2021	2022	2023	2023/2018
Import	177,125	254,430	257,186	315,548	191,898	108%
Export	1,272,159	948,815	1,820,092	2,099,413	2,227,737	175%
Trade balance	1,095,034	694,385	1,562,906	1,783,865	2,035,839	186%

Source: own compilation based on data available on Intracen.org (INTRACEN, 2024)

In Bulgaria, the imports of wheat decreased with 65% from 2019 to 2020, and increased with 95% from 2020 to 2021, with 32% from 2021 to 2022 and remain the same from 2022 to 2023. In Romania, the imports increased with 44% from 2019 to 2020, with 1% from 2020 to 2021 and with 23% from 2021 to 2022, however, from 2022 to 2023 the Romania's imports of wheat decreased with 39%. From 2019 to 2023 the value of imports with wheat increased with 67% in Bulgaria (9,724 thousand Dollars) and with 8% in Romania (14,773 thousand Dollars).

Regarding the exports of wheat and meslin, in Bulgaria the value of exports decreased with 26% from 2019 to 2020, and increased with 91% from 2020 to 2021, with 9% from 2021 to 2022 and with 16% from 2022 to 2023. In Romania, the exports decreased with 25% from 2019 to 2020, and increased with 92% from 2020 to 2021 and with 15% from 2021 to 2022 and with 6% from 2022 to 2023. From 2019 to 2023 the value of exports with wheat increased with 78% in Bulgaria (735,430 thousand Dollars) and with 75% in Romania (955,578 thousand Dollars).

Table 6 shows the evolution of foreign trade with rye in Romania and Bulgaria between 2019 and 2023. In the case of rye, the domestic production covers the necessities with rye from Bulgaria in the last years, trade balance being positive for 2021 – 2023 period. Meanwhile, the production of rye does not cover the consumption from Romania, so the imports are necessary, conducting to a negative trade balance from 2019 to 2023.

Table 6. Trade balance with rye (USD thousand)

	2019	2020	2021	2022	2023	2023/2018
Bulgaria						
Import	237	91	130	109	96	41%
Export	97	59	240	143	120	124%
Trade balance	–140	–32	110	34	24	–17%
Romania						
	2019	2020	2021	2022	2023	2023/2018
Import	638	794	553	1,226	1,032	162%
Export	93	48	37	65	111	119%
Trade balance	–545	–746	–516	–1,161	–921	169%

Source: own compilation based on data available on Intracen.org (INTRACEN, 2024)

In Bulgaria, the imports of rye decreased with 62% from 2019 to 2020, increased with 43% from 2020 to 2021 and decreased with 16% from 2021 to 202 and with 12% from 2022 to 2023. In Romania, the imports with rye increased with 24% from 2019 to 2020, decreased with 30% from 2020 to 2021, increased with 122% from 2021 to 2022, however, from 2022 to 2023 the Romania's imports of rye decreased with 16%. From 2019 to 2023 the value of imports with rye decreased with 59% in Bulgaria (141 thousand Dollars) and increased with 62% in Romania (394 thousand Dollars).

Regarding the exports of rye, in Bulgaria the value of exports decreased with 39% from 2019 to 2020, increased with 307% from 2020 to 2021, decreased with 40% from 2021 to 2022 and with 16% from 2022 to 2023. In Romania, the exports decreased with 48% from 2019 to 2020, and with 23% from 2020 to 2021 and increased with 76% from 2021 to 2022 and with 71% from 2022 to 2023. From 2019 to 2023 the value of exports with wheat increased with 24% in Bulgaria (23 thousand Dollars) and with 19% in Romania (18 thousand Dollars).

Trade balance with wheat is positive during the entire period, while in the case of rye the trade balance is positive only in 2022 and 2023, fact that can be caused by the multiple problems in this sector, noted by Radu (2019), from the small storage places for grains, grain transport system, to the lack of employee or machineries.

One of the most used trade measures of competitiveness is revealed comparative advantage, a market share indicator (Manevska-Tasevska & Rabinowicz, 2014) that was composed by Balassa (1965) and modified by Vollrath (1991). (Latruffe, 2010)

In order to determine the revealed comparative advantage, Balassa index was represented in Table 7 and Figure 3, being calculated by reporting Romania's/Bulgaria's wheat and rye export share from Romania's/Bulgaria's total exports of wheat and rye to the world's wheat and rye export share from total world's exports for the last 15 years available on Intracen.org.

Table 7. Balassa indexes for wheat and meslin and rye exports of Romania and Bulgaria on foreign markets

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bulgaria															
Rye	0,01	0,58	1,06	0,33	0,23	0,38	0,25	0,00	0,28	0,40	0,17	0,07	0,24	0,14	0,13
Wheat	7,06	10,05	7,83	10,09	12,36	9,28	10,74	12,93	11,08	12,03	13,16	8,56	12,60	10,47	13,81
Romania															
Rye	0,86	0,20	0,25	0,35	0,17	0,03	0,02	0,10	0,21	0,05	0,07	0,03	0,02	0,03	0,06
Wheat	3,96	4,64	2,62	4,50	7,59	7,23	5,38	8,67	7,19	7,18	7,65	5,22	8,03	7,85	8,70

Source: own compilation based on data available on Intracen.org (INTRACEN, 2024)

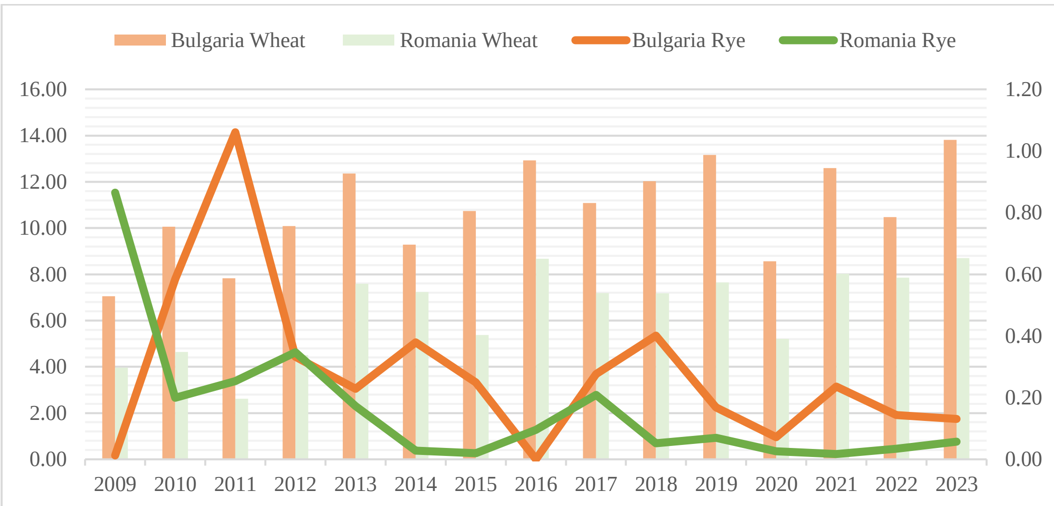

Figure 3. Balassa indexes for wheat and meslin and rye exports of Romania and Bulgaria on foreign markets

Source: own compilation based on data available on Intracen.org (INTRACEN, 2024)

The results of the analysis show that Bulgaria have a highly comparative advantage in terms of wheat and meslin provide a significant comparative advantage on the global market for Bulgaria and Romania, as evidenced by the Balassa index values of 13.8 and 8.7 in 2023. The Balassa index for rye indicates that neither Romania nor Bulgaria possesses a comparative advantage in this crop taking into consideration the Balassa index values.

In Romania, the highest comparative advantage for rye was 0.86 in 2009, first year analyzed and in 2023, 8.7 for wheat and meslin. In Bulgaria, the highest comparative advantage for rye was in 2010, 0.58 and for wheat in 2023, 13.81.

Conclusions

The importance of bakery grain sector is reflected in the statistics that shows that the consumption of Europe bakery products is forecasted to reach 40 million tons by 2029. Bread and bakery products are basic food in Romania and Bulgaria, the bakery grain being continuously dynamic.

The aim of this paper was to compare the bakery grain market competitiveness from Romania with the one from Bulgaria, taking into consideration a series of important indicators for this sector, most of them being used by other authors to analyze competitiveness, as described in “Introduction” section of the present paper.

The bakery grain sector from Romania is different, compared with the one from Bulgaria considering the area harvested with wheat and also with rye and the productions that are double in case of Romania, compared with Bulgaria. Another similarity between the two countries regarding wheat and meslin is the positive trade balance, both countries exporting more than importing. The bakery grain sector from Romania is the same, compared with the one from Bulgaria considering the trade balance with rye. The trade balance with rye in Bulgaria is negative from 2019 to 2020, while the trade balance with rye in Romania is negative for the entire period, from 2019 to 2023.

The export of wheat and meslin on the world market, in the broadest sense, bring a comparative advantage especially for Bulgaria, the Balassa index being 13,8 in 2023 and also for Romania, which had a value of Balassa index of 8,70 in the same year. The Balassa index for rye indicate that both countries, Romania and Bulgaria do not bring comparative advantages.

In general, to increase the competitiveness, the solutions identified by (Mizik, 2021) can be taking into consideration: supportive legislation, high value added, increasing the quality of production, innovations, improvements in terms of infrastructure, cooperation, European schemes, exchange rate, or export orientation. These aspects can be considered also in order to increase the competitiveness of the bakery grain market in Romania and Bulgaria.

It is important to underline that this research has limitations, especially regarding the differences between countries in terms of share of land, income of people from each country, surface of country etc. that were not taken into consideration at all in this study, this study being focused by the macroeconomic level of competitiveness between Romania and Bulgaria.

Other researchers can use multiple ways to conduct studies regarding the comparative analysis in terms of competitiveness between the two countries, like expanding the analysis of Balassa Index, add more indicators in order to be analyzed or taking into consideration more categories of bakery grains.

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LIVESTOCK WASTE MANAGEMENT PRACTICES

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Abstract
The report focuses on livestock waste management, which is a key aspect of sustainable agricultural development. Animal waste, including excreta, bedding materials, waste feed, dead animals, and other by-products, represents a significant environmental pollutant. Proper management of this waste is essential not only for environmental protection but also for reducing farm costs, creating new market opportunities, and increasing the sector's competitiveness. The adoption of innovative practices in livestock waste management is a modern solution aimed at transitioning towards a circular economy and supporting the European Union's green policies.

The main methods for effective waste management include anaerobic digestion and pyrolysis. Anaerobic digestion is a process that occurs in the absence of oxygen and allows for the conversion of organic waste into biogas. This biogas can be used as a renewable energy source, significantly reducing pollution and decreasing reliance on fossil fuels. Another important by-product of the process is biosolids, which can be utilized as fertilizers to improve soil fertility. Pyrolysis, on the other hand, is a thermal decomposition process of biomass without oxygen, producing bio-oils and biochar, which also have applications fuels and soil conditioners.

The report highlights the social, economic, and environmental benefits of proper livestock waste management. Effective waste utilization contributes to improving soil structure, reducing methane emissions, and limiting water pollution. One of the most common methods of waste management is the application of manure to agricultural lands, which enhances the organic content of the soil. However, improper or excessive use of manure can lead to nutrient overload and environmental contamination, underscoring the need for precise management.

Innovations such as the use of artificial intelligence and blockchain technologies provide new opportunities for process optimization. These technologies help farmers manage resources more efficiently and reduce the negative impacts on the environment. The report concludes that integrating technology, improving regulatory frameworks, and investing in farmer education are essential for sustainable livestock waste management. By adopting these measures, livestock waste can be transformed into a valuable resource, supporting both agricultural sustainability and the global circular economy.

Key words: agriculture, environment, innovation, waste management
JEL: O3, Q1, Q53.

Introduction

The expansion of agricultural production naturally leads to increasing amounts of livestock waste, crop residues and by-products from the agricultural industry. It has

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been suggested that agricultural waste contributes to a significant proportion of the total waste in the developed world and pollutes the environment to the highest extent (Obi et al., 2016). Livestock wastes are found in different states – gas, liquid and solid wastes.

Proper management of animal waste can:

- improve the state of the environment;
- reduce farm costs;
- open up opportunities for new markets;
- increase the competitiveness of livestock farming as a sector.

The application of innovative practices, artificial intelligence, blockchain technologies, etc. in livestock waste management are good examples of modern solutions to the problem (Georgieva, 2023). The exploitation of resources should not exceed their regenerative capacity, and the disposal of waste should not exceed the capacity of the environment to absorb it (Atanasov, 2023). Good implementation of environmentally sound practices is key to achieving all the objectives of the CAP and in particular the environmental (Blagoev, 2022).

The goal of this report is to present some practices that can and are being applied in the livestock industry to reduce and/or convert operational waste into products of value.

Livestock waste includes:

- excreta mixture (manure);
- bedding material (sawdust, straw);
- waste feed;
- dead animals;
- broken eggs, feathers;
- and another farm waste.

In modern livestock farming, increasing attention is being paid to alternative ways of recovering waste from the operation, with pollution control being the main objective. Waste can be fully and completely utilized, but as livestock farming and the environment interact constantly, accurate waste management is essential to avoid harmful effects on nature and man. Livestock waste emits large quantities of carbon dioxide and ammonia, which can contribute to:

- ACID rain and the greenhouse effect;
- pollution of water sources;
- the spread of infectious diseases.

Social tensions over bad smells and water pollution can build up when livestock waste is discharged into water sources in an unplanned manner. Efficient utilization of animal waste from large farms is necessary to curb pollution and spread of diseases (Parihar et al., 2019).

The benefits of proper livestock waste management are:

- maintaining soil fertility in soils with insufficient organic content. Adding manure to soil increases nutrient holding capacity, improves the physical condition of the soil by increasing its water holding capacity, and improves soil structure;
- creating a better climate for soil microflora and fauna;
- using manure as fuel;
- producing energy from manure;
- reducing post-harvest losses;
- reducing the source of infection for animals and humans;
- reducing the source of methane emissions;
- reducing environmental pollution and odors;
- reducing the harmful effects of flies;
- reducing the loss of organic matter;
- reducing illegal dumping of waste, which poses a direct threat to soil quality and water sources;
- improving soil fertility, the nitrogen in manure is fixed in its organic state until, through decomposition, it is converted to a soluble form – ammonium nitrate (FAO, 2009).

Bioenergy sources are increasingly attracting attention as a sustainable energy resource that can help address challenges such as:
- growing energy demand;
- rising fuel prices;
- providing substitutes for expensive fossil fuels.

Biogas from animal waste provides renewable and environmentally friendly sources that support sustainable agriculture. In addition, the by-products from the "fermenters" provide premium quality organic waste (Arthur, Baidoo, 2011).

Practices for livestock waste processing

The effectiveness of waste management in livestock production is a multifaceted variable that is influenced by technological advances, regulatory frameworks, socioeconomic considerations, and the unique characteristics of regional farming practices. The implementation of resource efficiency practices in livestock production is inextricably linked to the effectiveness of waste management. Technological innovations, regulatory frameworks, circular economy principles, economic considerations, social dimensions, and geographic context all influence the success of resource efficiency initiatives (Wang'ombe, 2023).

Biomass energy is renewable, sustainable and environmentally friendly, derived from renewable sources such as agricultural and municipal waste. Biomass can be converted into gaseous fuels using various methods such as anaerobic digestion and gasification or converted into a form of energy – biofuel (Mathew, Zakaria, 2015).

Anaerobic digestion (a biological process for converting waste materials into biogas in the absence of oxygen) is the most efficient way to convert waste into resources and is an alternative technology for energy production It is a natural process that occurs in many places in nature:

- at the bottom of bodies of water;
- in the bodies of ruminants;
- in soils, etc. (Tufaner et al., 2017).

The two main by-products of anaerobic digestion are gas and solid – biogas and biosolids. Gas is a natural by-product and manure is a by-product of bioreactors processing biodegradable waste. As a stable carrier, biogas is usually composed of methane (35-40%) and carbon dioxide (60%) and various other gases such as ammonia, hydrogen sulfide, hydrogen, oxygen, nitrogen, and carbon monoxide (Sun et al., 2015). The biogas production process is affected by temperature, pH, volatile fatty acid content, etc. Good control of these factors determines the quality and quantity of biogas produced. The production of biogas from animal waste is an important step towards the utilizations of one of the most widespread but still underused energy sources. Anaerobic digestion is an environmentally friendly method leading to the production of energy in the form of biogas and residue which could be used as soil conditioner (Dhanalakshmi Sridevi, Ramanujam, 2012).

The advantages of anaerobic digestion of waste are:

- less number of odors emitted;
- reduction in the number of pathogens;
- use of decomposed organic waste as manure (Iglinski et al., 2015).

The increase in the number of livestock heads raised, respectively, increases the amount of waste from livestock farms, which in turn increases the risk of air and environmental pollution. Anaerobic digestion is an example of a cost-effective way to dispose of animal waste and reduce dependence on fossil fuels (Mulka et al., 2016).

Thermochemical conversion of biomass to produce various solid, liquid and gaseous products can be carried out by pyrolysis, a method in which the organic matrix undergoes direct thermal decomposition in the absence of oxygen. The thermal decomposition behavior of different biomasses affects the composition of the bio-oil and its production rate (Yang et al., 2014). Pyrolysis, is a complex process consisting of many steps and depends on:

- temperature;
- oxygen content;
- the composition of the introduced biomass (due to oxidation).

Pyrolysis can be an exothermic process, but due to reduction processes it is mostly endothermic. For most biomass species containing oxygen-rich hemicellulose, decomposition is endothermic below a temperature of about 400 – 450 °C and exothermic above this threshold (Lewandowski et al., 2020). From an economic point of view, the proportion of the liquid fraction in biomass pyrolysis products should be the largest (Kowalik, 2008), (Popczyk, 2008). In the pyrolysis process, biomass decomposes at high temperature in the absence of oxygen (Lim et al., 2012). Not only the value of temperature but also the rate of its increase affects the course of thermal decomposition as well as the composition of the products of the process, therefore pyrolysis is divided into slow, fast and flash processes (Bridgwater, 2012). The flash pyrolysis process is preferred for processing biomass into liquid fuel, e.g., bio-oil, while the slow pyrolysis is used for biochar production (Pragya et al., 2013), (Mahlia et al., 2019).

The most widespread practice for animal waste management is the spreading of animal manure (solid and/or liquid) into the soil. The advantages of animal waste fertilization are:

- soil properties are improved;
- supply nutrients needed for the growth of the crops grown;
- increases the organic matter content of the soil.

A disadvantage of this method is the risk of using excessive amounts of manure, which leads to a build-up of nutrients in the soil. A certain amount of the nutrients present in manure can be used by plants to regulate various physiological processes, but the excess nutrients end up in the surrounding ecosystem and cause environmental pollution. In order to improve the sustainability of manure management, researchers worldwide have been focusing on developing and testing various biological, physical and chemical processes to treat the highly polluted waste streams from livestock production over the past few decades (Chowdhury et al., 2020).

Conclusion

Addressing the problem of waste and by-products in a sustainable and environmentally friendly way is a crucial issue for the agricultural production and food industry. The generation of increasing amounts of waste, including from animal husbandry and animal product processing, raises questions about its management, minimization and the search for ways to recover it. Livestock farms generate a large amount of animal waste. Managing manure as a resource can bring benefits to livestock farmers. Livestock waste management helps to maintain soil fertility in soils with insufficient organic content. Effective management of livestock waste helps to enhance the socio-economic status of developing countries as well as reduce the likelihood of spread of diseases from waste. The effective utilization of livestock waste can be achieved through the development of an integrated methodology for its management, by implementing various policies and strategies with a priority on ensuring consumer health and environmental quality.

Livestock, as an integral part of global agriculture, is facing increasing and serious challenges related to waste management and resource use. The following recommendations can serve to address, if not all, then a large part of them:
- promote precision agriculture technologies;
- improving the regulatory framework;
- integrating circular economy principles;
- investment in farmer training;
- information campaigns;
- research and development initiatives.

Farmers who are willing to process farm waste innovatively largely lack the necessary information and/or experience. For other farmers, it is necessary to explain that waste has an added value when properly treated. With good planning, proper infrastructure and proper financing from banking institutions, farmers can find new uses for livestock waste.

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MANAGEMENT AND CONTROL OF THE REGIONAL DEVELOPMENT PROGRAMME 2021 – 2027

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Abstract
The Regional Development Program is a key European Union (EU) policy aimed at reducing regional disparities, fostering economic growth, and ensuring sustainable development in less-developed regions. The program provides substantial financial resources to improve infrastructure, stimulate business activity, and promote social inclusion. A complex institutional framework, involving numerous national and European bodies, ensures the effective and transparent use of these funds. Launching the Regional Development Program during the 2021 – 2027 programming period presented significant challenges. This report examines the program's management and control mechanisms and identifies problematic areas in the preparation of its strategic documents. A crucial aspect of program management is the institutional framework defined within the applicable European regulatory framework. The multi-tiered control framework involves various national and European bodies, with specific functions and responsibilities at European, national, and regional levels. The report also incorporates perspectives from various authors on monitoring and control procedures, informing the development of a conceptual model for managing Structural Funds. Effective control and monitoring, incorporating both internal and external verification mechanisms, are crucial for achieving program objectives and ensuring the efficient use of public funds. Challenges include bureaucratic procedures and inter-institutional coordination. Optimizing procedures and strengthening institutional cooperation are essential for enhancing control effectiveness.
Keywords: Control, Regional Development Program, EU Funds, Institutional Framework, Monitoring, Expenditure Control
JEL code: G18, Q18

Introduction

The Regional Development Program 2021 – 2027 implements the European Union's (EU) policy aimed at mitigating regional disparities and fostering more balanced territorial development. Historically, EU Cohesion Policy has manifested through Operational Programs in individual member states. This report examines the management and control mechanisms of the Regional Development Program, highlighting problematic areas in the national-level preparation of strategic documents and the factors contributing to project approval delays.

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1. European Regulatory Framework for the Regional Development Program

EU Cohesion Policy undergoes revisions during each programming period, largely influenced by evolving EU policies and needs. The process of developing the strategic regulatory framework often lags behind the requirements of member states and regions. Despite this inertia, regulations define the program's framework. These regulations form part of the updated EU Cohesion Policy, redirecting regional development strategies. They provide guidelines for managing, allocating, and utilizing EU funds within the new programming period.

Operational Program management principles follow the precedent of the previous programming period, employing a Common Regulation establishing the structure and framework for various EU funds. Each EU Structural Fund has a corresponding applicable regulation.

Common Regulation (EU) 2021/1060 (the Common Provisions Regulation)

The Common Provisions Regulation (EU) 2021/1060 establishes general provisions for various EU funds, including the European Regional Development Fund (ERDF), the European Social Fund Plus (ESF+), the Cohesion Fund, and the Just Transition Fund. It outlines and regulates planning, management, and fund utilization principles. Its primary objective is streamlining procedures and facilitating member state and regional access to the strategic priorities of EU policies across various sectors.

Key elements of the regulation include five policy priorities strategically oriented toward Europe: A Smarter Europe, A Greener Europe, A More Connected Europe, A More Social Europe, and A Europe Closer to Citizens.

Crucially, the partnership principle, emphasized throughout the programming period, influences national policies in drafting Operational Programs and the Regional Development Program. The regulation mandates the involvement of regional and local authorities, social partners, and stakeholders in the planning and implementation process.

Compared to previous programming periods, both for all Operational Programs and the Regional Development Program, there is a trend towards optimizing and simplifying application and approval procedures for project proposals. Administrative burdens on beneficiaries are reduced through more flexible financial instruments.

Specific rules and guidelines for construction, management, and control are detailed in Regulation (EU) 2021/1058 for the ERDF and Cohesion Fund. This regulation focuses on the strategic goals of EU regional policy, promoting sustainable development and economic convergence. The ERDF targets economically lagging regions, while the Cohesion Fund supports less-developed member states with GDP per capita below 90% of the EU average.

The ERDF's main priorities are:

- Support for innovation, research, and technology;
- Support for small and medium-sized enterprises (SMEs);
- Sustainable development and energy efficiency;
- Development of digital technologies;
- Sustainable urban development.

Integrated management of EU funds necessitates a focus on different European funds. The Cohesion Fund concentrates on infrastructure, environmental, and transport projects improving connectivity and sustainability, crucial for regional development.

Financing related to the ESF+, covered by Regulation (EU) 2021/1057, is also vital in regional development policy. The ESF+ supports employment, social inclusion, and education, consolidating several previous funds and programs. The regulation sets guidelines for combating poverty, unemployment, and social exclusion, focusing on vulnerable groups.

The ESF+'s priorities include:

- Improving skills and qualifications;
- Support for quality education and training;
- Promoting equality and combating discrimination;
- Improving access to healthcare and social care services.

2. Establishing Control Mechanisms for the Regional Development Program 2021 – 2027

Establishing control mechanisms for the Regional Development Program 2021 – 2027 follows established program frameworks and strategic priorities, considering national regulations. According to some authors (Talaga, 2014), effective management and control of regional program funds require an integrated approach incorporating European and national legal frameworks to define and control fund utilization. The legal frameworks governing fund distribution are crucial for regional development and ensuring proper EU fund control. A frequently cited approach for building control systems for Operational Programs is the institutional approach. Proponents view EU fund control as an "institutionalized approach to management, ensuring the correct allocation and use of funds, based on procedures that guarantee the legality and appropriateness of expenditures" (Dimitrova, 2019).

More narrowly, other authors (Sedlarski & Mihaylova-Goleminova, 2016) emphasize control as a "legal-administrative process encompassing the management, monitoring, and reporting of European funds through managing authorities, certifying bodies, and audit institutions." They highlight control throughout the project cycle. Conversely, other authors (Georgiev & Stanev, 2023) offer a crisis management perspective, emphasizing the timely preparation of strategic and operational documents for effective decision-making. They highlight risk analysis and assessment as crucial for successful management.

Our perspective aligns with institutional theory, but the challenges and dynamism of the environment necessitate a flexible decision-making approach with opportunities for autonomy. A comprehensive approach, considering regional characteristics and the expectations of local communities involved in project proposals, should be adopted when establishing control mechanisms.

3. Analysis and Evaluation of the Institutional Control Framework for the Regional Development Program

The institutional control framework for the Regional Development Program builds upon established approaches and accumulated expertise from previous programming periods.

The Managing Authority for the Operational Program is strategically positioned within the Ministry of Regional Development (e.g., the General Directorate "Strategic Planning and Regional Development Programs"). The Certifying Authority (e.g., the "National Fund Directorate" within the Ministry of Finance) is responsible for receiving EU payments, preparing certified expenditure reports, and submitting payment requests to the European Commission. This authority verifies:

- Accuracy of expenditure reports;
- Compliance of declared expenses with EU and national legislation.

The Certifying Authority maintains electronic accounting data, monitors funds, ensures beneficiary payments, and informs the European Commission of any irregularities.

The Executive Agency "Audit of EU Funds" plays a crucial role in controlling and managing EU funds. Its responsibilities include conducting expenditure and operational audits, providing guidance to the Managing Authority, monitoring project implementation, and communicating with the European Commission. The agency's annual audit plan prioritizes audit activities based on risk analysis.

4. Identified Issues in Managing and Controlling the Regional Development Operational Program

The Regional Development Operational Program, like other Operational Programs, experienced significant delays in commencement. Delays in submitting project proposals stem from the country's inability to prepare strategic documents for timely European-level approval. This delay in institutional management mechanisms hinders the program's launch. Contributing factors include political instability and the COVID-19 pandemic.

Furthermore, there is a lack of effective coordination among beneficiaries and stakeholders in defining regional priorities aligned with European objectives. Integrating regional policies at regional and national levels presents a significant challenge requiring stakeholder commitment.

Conclusion

The Regional Development Operational Program plays a crucial role in Bulgaria's socio-economic development. Effective expenditure control is vital for the program's success, ensuring transparent and efficient use of EU funds. Improving control and management mechanisms is crucial for achieving sustainable regional development. This requires political will, timely preparation of strategic and operational documents, improved staff training and resources, optimized application and management procedures, and enhanced transparency in communication.

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FARMERS' PORTFOLIO DIVERSIFICATION FOR INCOME GROWTH: A STUDY ON THE MUNICIPALITIES OF DIMAL AND KUCOVE

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Abstract

In the face of numerous economic and social challenges, rural communities in Albania, particularly in the municipalities of Dimal and Kuçovë, struggle with income instability and poverty. A key strategy to address these issues is diversifying the economic portfolio of households, which can serve to increase income and reduce vulnerability to external economic shocks. This study investigates the impact of diversifying income sources in rural areas on the economic growth of villagers. Our analysis focuses on sectors such as agriculture, livestock, rural tourism, and services, which together form the core of the rural economy.

Using a mixed-method approach, the study combines theoretical frameworks on economic diversification with empirical evidence gathered through both quantitative and qualitative data collection. Quantitative data, such as income statistics and employment figures, are complemented by qualitative insights from interviews and focus group discussions with local farmers, business owners, and policymakers. This comprehensive approach enables us to assess how different forms of economic activity contribute to income growth and poverty alleviation in these communities.

The results indicate that households with more diversified income sources, particularly those expanding into non-agricultural sectors like rural tourism and small-scale services, experience higher income growth and greater economic stability. Diversification also helps mitigate risks related to market fluctuations and climate variability, thus making families less vulnerable to poverty. However, the success of such diversification efforts heavily depends on the presence of institutional support, access to credit, training programs, and infrastructural development.

Based on these findings, the study proposes several policy recommendations aimed at supporting economic development in rural areas. These include enhancing infrastructure, facilitating access to markets, and creating policies that encourage innovation and entrepreneurship in non-agricultural sectors. Institutional support, such as training and capacity-building programs for farmers, plays a critical role in fostering successful diversification strategies.

In conclusion, the study demonstrates that economic portfolio diversification significantly contributes to income growth and poverty reduction, thereby promoting sustainable development in rural areas. By addressing both the opportunities and challenges of economic diversification, this research provides a roadmap for policymakers seeking to improve rural livelihoods and enhance the resilience of these communities in the face of ongoing economic and environmental challenges.

Keywords: portfolio diversification, rural development, agriculture, livestock, rural tourism
JEL: Q12, Q19

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Introduction

Rural areas in Albania, particularly in the municipalities of Dimal and Kuçove, face a myriad of economic and social challenges that hinder sustainable development. These regions are characterized by limited access to essential services, inadequate infrastructure, and a heavy reliance on agriculture as the primary source of income. The agricultural sector in these areas is often underdeveloped, with low productivity and limited access to markets, which exacerbates the vulnerability of rural households to economic shocks.

The objective of this research is to assess the impact of economic portfolio diversification on income growth and poverty reduction in the rural municipalities of Dimal and Kuçovë, with a focus on specific sectors such as agriculture, livestock, rural tourism, and small-scale services.

Income diversification in rural areas has been recognized as a crucial strategy for improving the livelihoods of rural households. Diversification not only helps in stabilizing income but also plays a significant role in poverty reduction and the overall economic development of rural communities.

In the context of Dimal and Kuçove, where economic opportunities are scarce, promoting income diversification is essential for fostering sustainable development. By expanding the economic portfolio of rural households, these communities can build a more robust and resilient economy, better equipped to withstand external shocks and provide a higher standard of living for their residents.

1. Economic Diversification in the Perspective of Different Authors

The study of economic diversification, rural development, and poverty reduction is informed by key theoretical frameworks. The livelihoods approach, developed by Robert Chambers and Gordon Conway, emphasizes diversifying livelihood strategies to enhance rural households' resilience and well-being by managing risks from market fluctuations and environmental changes. This approach is particularly relevant to areas like Dimal and Kucove, where dependence on agriculture leaves households vulnerable. The endogenous development theory, discussed by Paul Hodge and Richard Le Heron, suggests sustainable rural development by leveraging local resources and capacities, focusing on enhancing local agricultural products and developing new sectors like rural tourism. Lastly, the poverty traps model by Jeffrey Sachs explains how low income and limited resources perpetuate poverty cycles, indicating that targeted interventions for income diversification could help break these cycles in areas with limited economic opportunities

The capabilities approach, developed by Amartya Sen, offers a crucial perspective on rural development by emphasizing the expansion of people's abilities to lead valued lives, beyond just economic growth. In rural areas like Dimal and Kucove, improving capabilities through education, skill development, and diverse economic opportunities is key for more stable and rewarding livelihoods. Empirical research shows that economic diversification positively impacts income growth and poverty reduction. For instance, Ellis (2000) found that mixing agricultural and non-agricultural activities enhances resilience and income stability. In Albania, studies by Pinder and Sinclair (2008) highlight rural tourism's potential as an alternative income source, while De Soto, Gordon, and Gedeshi (2002) note that remittances diversify income but can create vulnerabilities if not supported by local economic development. Research by Toska and Mane (2013) and Hoxha (2016) underscores that in Dimal and Kucove, challenges like limited market access and infrastructure constrain diversification efforts, indicating the need for targeted policies to promote economic growth and reduce poverty.

2. Methodology

The methodology includes calculating a **diversification index**, which measures the balance of income sources across different sectors. This index is calculated using the following formula:

$$\text{Diversification Index} = 1 - \sum \left(\frac{Income\ from\ each\ source}{Total\ income}\right)^2$$

This formula considers both agricultural and non-agricultural sources, which are further subdivided into specific activities, such as rural tourism, remittances, services, and small-scale industries. The index value ranges from 0 (no diversification) to 1 (full diversification).

3. Diversification of Farmers' Portfolios: The Case of the Municipalities of Dimal and Kuçove

Dimal and Kucove, municipalities in the Berat district with populations of 27,295 and 55,293 respectively according to the 2011 Census, are the focus of a study assessing the impact of economic diversification on income growth among rural households. This study uses a quantitative research design based on secondary data from official sources. It analyzes data on income levels, employment, and both agricultural and non-agricultural economic activities from INSTAT, the Ministry of Agriculture and Rural Development, and the Ministry of Economy and Finance to evaluate the relationship between economic diversification and income growth. The analysis is based on statistical data from 2012 to 2023, focusing on changes in household income, employment trends, and diversification patterns.

Table 1. Household income growth and diversification (2012 – 2023)

Year	Average Household Income (ALL)	% Income from Agriculture	% Income from Non-Agricultural Sources	Diversification Index (0-1)
2012	450,000	70%	30%	0.3
2013	460,000	68%	32%	0.32
2014	470,000	65%	35%	0.35
2015	480,000	63%	37%	0.37
2016	500,000	60%	40%	0.4
2017	520,000	58%	42%	0.42
2018	540,000	55%	45%	0.45
2019	560,000	52%	48%	0.48
2020	580,000	50%	50%	0.5
2021	600,000	48%	52%	0.52
2022	620,000	45%	55%	0.55
2023	640,000	42%	58%	0.58

Source: Prepared independently based on INSTAT annual reports

The results show significant improvements in both income growth and employment rates, attributed to increased economic diversification:
Household *Income growth:* From 2012 to 2023, the average household income in Dimal and Kuçovë increased from 450,000 ALL to 640,000 ALL, reflecting an overall growth of approximately 42.2%. This growth indicates a steady improvement in the economic status of rural households.
Shift in income sources: The data shows a significant shift in the composition of household income. In 2012, 70% of income was derived from agriculture, while only 30% came from non-agricultural sources. By 2023, the reliance on agriculture had decreased to 42%, with 58% of income coming from diversified non-agricultural activities. This shift highlights the increasing importance of income diversification in these municipalities.
Diversification index: The diversification index, which measures the variety and balance of income sources, increased from 0.30 in 2012 to 0.58 in 2023. This suggests that households have increasingly engaged in multiple economic activities, reducing their dependence on agriculture.

Table 2. Employment rates and sectoral distribution (2012 – 2023)

Year	Employment Rate (%)	% Employed in Agriculture	% Employed in Non-Agricultural Sectors	Unemployment Rate (%)
2012	55%	65%	35%	20%
2013	56%	63%	37%	19%
2014	57%	60%	40%	18%
2015	58%	58%	42%	17%
2016	60%	55%	45%	16%
2017	61%	53%	47%	15%
2018	63%	50%	50%	14%
2019	64%	48%	52%	13%
2020	66%	45%	55%	12%
2021	68%	43%	57%	11%
2022	69%	40%	60%	10%
2023	70%	38%	62%	9%

Source: Prepared independently based on INSTAT annual reports.

Referring to Table 2, it can be observed that, the employment rate in Dimal and Kuçovë increased from 55% in 2012 to 70% in 2023, indicating a significant improvement in job availability and economic engagement. This is closely tied to the diversification of economic activities.

Sectoral shift: The percentage of people employed in agriculture decreased from 65% in 2012 to 38% in 2023, while employment in non-agricultural sectors increased from 35% to 62%. This shift reflects the broader economic diversification that has taken place, with more individuals finding opportunities outside of traditional agriculture.

Unemployment reduction: The unemployment rate dropped from 20% in 2012 to 9% in 2023. The expansion of non-agricultural sectors likely played a crucial role in reducing unemployment and providing more stable income opportunities for the rural population.

The findings clearly indicate that economic diversification has had a significant positive impact on income growth in Dimal and Kuçovë. Households that engaged in a variety of non-agricultural activities were better able to increase their income and improve their economic resilience. The shift away from agriculture as the primary source of income has reduced the vulnerability of rural households to economic shocks, particularly those related to agricultural productivity and market fluctuations. The expansion of non-agricultural sectors not only created more employment opportunities but also contributed to a substantial reduction in unemployment rates. This, in turn, has likely played a role in poverty reduction, as more households can now rely on multiple income sources.

Here is the figure 1, illustrating the relationship between the diversification index and average household income from 2012 to 2023. The graph demonstrates how increased economic diversification correlates with higher income levels over the years, highlighting the positive impact of diversification on income growth in Dimal and Kuçovë.

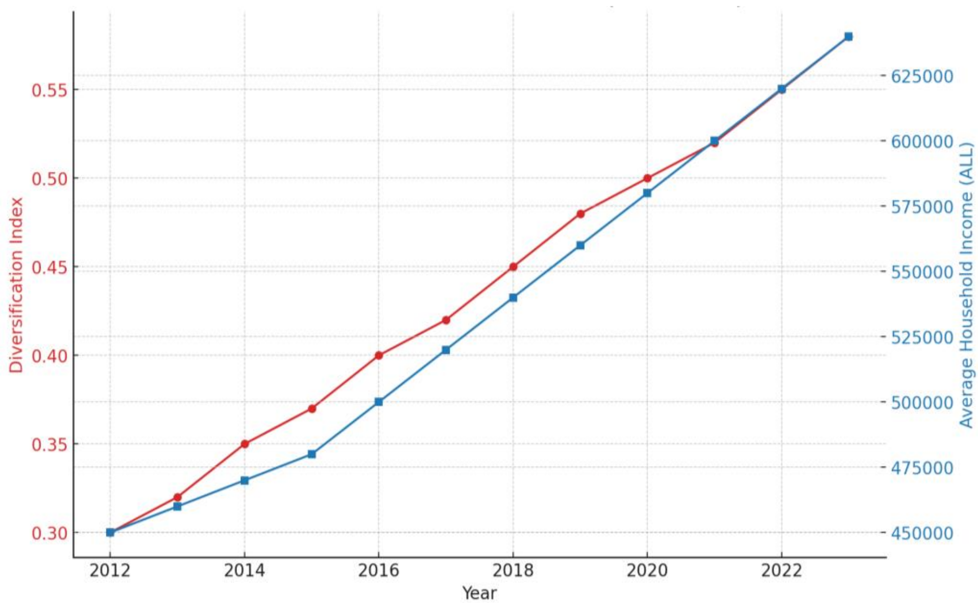

Figure 1. Income diversification and growth (2012 – 2023)

Source: Prepared independently based on INSTAT annual reports

The analysis of statistical data from 2012 to 2023 demonstrates that economic diversification has been a crucial factor in driving income growth and improving the livelihoods of rural households in Dimal and Kuçovë. By reducing dependence on agriculture and expanding into non-agricultural sectors, these communities have built a more resilient economic base, better equipped to handle external shocks and provide a higher standard of living for their residents. The findings support the importance of continued efforts to promote diversification as a strategy for sustainable rural development.

4. Conclusion

The study concludes that economic diversification is a key driver of income growth and poverty reduction in rural areas. Households in Dimal and Kuçovë that diversified their income sources experienced significant economic improvements. Diversification reduced dependence on agriculture, increased resilience to external shocks, and contributed to sustainable economic development.

The analysis, based on data from official sources spanning 2012 to 2023, revealed several significant findings.

1. The study found a positive correlation between economic diversification and income growth. Households in Dimal and Kuçovë that diversified their income sources engaging in non-agricultural activities such as rural tourism, small-scale manufacturing, and services experienced a substantial increase in income. Specifically, the average household income in Dimal and Kuçovë increased by approximately 33% and 34%, respectively, over the last decade.
2. The data also showed that economic diversification played a critical role in reducing poverty. The poverty rate in Dimal decreased from 22.5% in 2012 to 16.2% in 2023, while in Kuçovë, it dropped from 24.8% to 17.5% during the same period. The decline in poverty is strongly linked to the diversification of income sources, which reduced households' vulnerability to agricultural risks and economic shocks.
3. Between 2012 and 2023, economic diversification in the rural areas of Dimal and Kuçovë significantly increased, as evidenced by the rise in the diversification index from 0.30 to 0.58. This indicates that households have increasingly engaged in non-agricultural activities, reducing their dependency on agriculture.
4. Alongside the increase in diversification, average household income grew from 450,000 ALL to 640,000 ALL during the same period, demonstrating a positive impact of diversification on income growth.
5. The percentage of income derived from agriculture decreased from 70% to 42%, while income from non-agricultural sources rose to 58%. This shift has made rural households less vulnerable to economic shocks affecting the agricultural sector.
6. Economic diversification has led to higher employment rates and a reduction in unemployment from 20% to 9%, contributing to the overall improvement in economic conditions and poverty reduction in these communities.

These conclusions support the view that economic diversification is an effective strategy for promoting income growth and enhancing the economic resilience of rural households in Dimal and Kuçovë.

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DIGITAL CONTENT ON THE CUSTOMER JOURNEY IN AGRICULTURAL BUSINESS

VANKOV, NIKOLAY[1]

Abstract
The report explores the pivotal role that digital content plays in shaping consumer behavior in the agricultural business sector. It underscores how digital content impacts the entire customer journey, from the initial exposure to a brand, through the decision-making process, to the eventual purchase and ongoing consumer engagement. The research delves into the marketing funnel, a key model for understanding how businesses can guide potential customers through various stages-awareness, interest, evaluation, decision, and loyalty-ultimately transforming them into loyal advocates of the brand. In agribusiness, where traditional practices have long dominated, the integration of digital strategies has become indispensable. The report identifies several strategic components of the marketing funnel that agricultural enterprises can leverage to optimize their digital presence. These components are essential not only for attracting new customers but also for maintaining long-term relationships with them. By utilizing various digital channels such as social media, content marketing, search engine optimization (SEO), and targeted advertising, agricultural businesses can engage their audience more effectively at different stages of the customer journey. One of the core findings of the research is the importance of creating a cohesive digital strategy tailored to the specific needs of agricultural businesses. This involves selecting the right mix of digital channels and tools to reach potential customers, raise awareness, and eventually drive conversions.
The study emphasizes that, in today's fast-evolving digital environment, agricultural enterprises cannot rely solely on traditional marketing techniques. Instead, they must adopt digital tools that allow for better personalization and interaction with customers. This not only enhances customer satisfaction but also builds stronger brand loyalty. Furthermore, the report highlights the critical role that innovation and technology play in modern agribusiness. The adoption of cutting-edge technologies, such as data analytics and automation, can significantly enhance the effectiveness of digital marketing campaigns. Investing in analytical tools allows businesses to track consumer behavior and fine-tune their marketing strategies for maximum impact. In addition, training staff in digital technologies is key to ensuring that these strategies are implemented effectively.
In conclusion, the report recommends that agribusinesses expand their digital presence by adopting innovative technologies and developing comprehensive digital marketing strategies. This includes investing in tools that provide insights into consumer behavior and offering training programs to build digital competency within the workforce. By doing so, agricultural enterprises can improve their competitiveness, foster customer loyalty, and thrive in the rapidly changing business environment.
Keywords: marketing funnel, digital content, customer journey, marketing funnel components (before, during and after purchase)
JEL code: M31, Q16, O33

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1. Introduction

At a time when digitization is transforming all aspects of economic life, agricultural business is also undergoing significant changes under the influence of digital technologies. The purpose of this research is to examine the importance of digital content in the customer journey in the agricultural industry, with a particular focus on how this content influences customer behavior and decision-making processes. As digital platforms and digital content generation strategies evolve, agricultural business faces new challenges and opportunities to engage customers in new and innovative ways.

The research sub-objectives are aimed at analyzing the impact that different types of digital content have at different stages of customer journey. It will examine how content influences awareness, perception, engagement and ultimately purchase of agricultural business products and services. The report provides a comprehensive view of the marketing funnel, from theoretical discussions to practical applications at various stages of the customer journey. By looking at the variety of digital channels and methods, this research aims to identify strategies that can improve the effectiveness of digital campaigns in agricultural business.

The research will employ a mix of research methods, including data analysis from social media, websites, blogs, advertising campaigns and interviews with agricultural business stakeholders. This approach will contribute to a more accurate and objective understanding of the role of digital content in marketing. The research will offer useful insights and conclusions to optimize digital strategies in agricultural business, providing a better understanding of consumer needs and increasing their satisfaction.

2. Digital content and marketing funnel – importance for agricultural business

Digital content encompasses any information that exists in a format that can be processed by computers, including different types of data such as software (computer programs and mobile applications), visual content (digital photos, videos and animations), audio content (music and podcasts) and text (emails, data set and blog posts). The proliferation of digital content in the Internet age has changed the way people and businesses share and create content.

In this regard, in the practice of creating and distributing digital content, the concept of “marketing funnel” has become established. A marketing funnel is a model used in marketing to describe the process of converting potential customers into actual customers. The funnel is so named because it looks like a vessel with a wide neck at the top that tapers toward the bottom.

The main stages of the marketing funnel are:

- *Awareness* – this stage involves drawing attention to the brand and its products or services. This can be achieved through digital advertising, content marketing, social media, search engines and more.
- *Interest* – when the potential customer has information about the brand and its products, interest in them may arise. This stage involves providing more information about the brand and its products to increase interest.
- *Evaluation* – after the potential customer has shown interest, it should be evaluated whether the brand's products meet his needs and requirements. This stage involves providing more details about the brand's products and services.
- *Decision / action / conversion* – this stage involves deciding to purchase the brand's products or services. And when the prospect makes that purchase decision, an action follows to make that purchase happen.
- *Loyalty* – Customers continue to buy from the brand regularly. The goal is to build a strong relationship that encourages repeat purchase.
- *Advocacy* – Customers are so satisfied that they actively recommend the brand to other consumers. The goal is to turn loyal customers into enthusiastic brand ambassadors.

The purpose of the marketing funnel is to convert a potential customer into an actual customer and increase brand sales. To achieve this goal, appropriate marketing strategies are used for each of the indicated stages of the funnel.

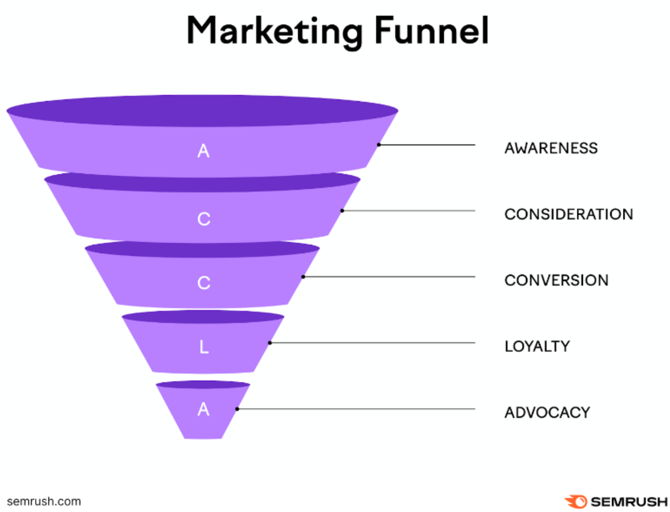

Figure 1. Marketing Funnel

Source: Salsi, H. (2024)

Using the marketing funnel allows businesses to identify and optimize key customer touch points at every step of their path to purchase, increasing the likelihood of successful sales completion and fostering long-term relationships.
The classic model of the marketing funnel includes 3 levels (phases).

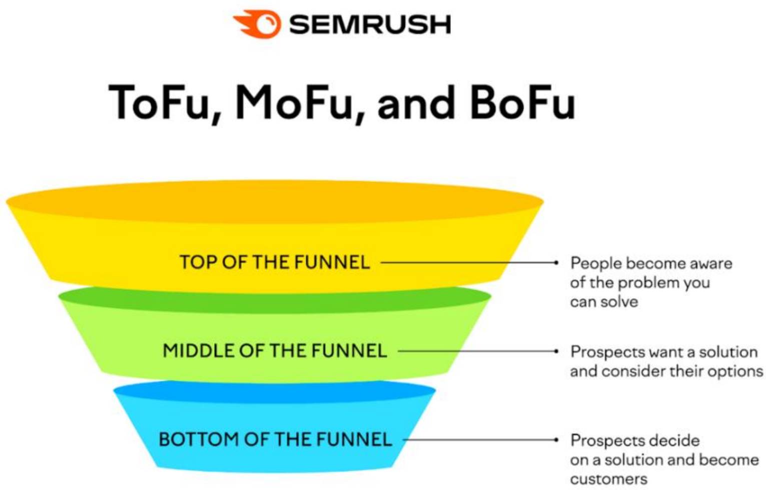

Figure 2. A classic 3-level marketing funnel model

Source: https://www.semrush.com/blog/marketing-funnel/, visited on 20.09.2024

Top of Funnel (ToFu) is the beginning of a marketing funnel, or it is the first contact with potential customers. In this phase, the goal is to reach potential customers, to attract their attention and to provoke their subsequent interest, which has materialized with action. Attention and interest is generated through some content (article, social media post Facebook, Instagram, infographic, video, book, photo, status, podcast, email, bot message, broadcast participation, etc.). Here, the content is not fully consumed, but is mostly "packaging" (headline, photo, video advertisement). Businesses realize this in two ways – paid (eg article advertising) or organic (users find the brand themselves through Google or through the sharing of someone – media and/or friend). In the ToFu phase, the channels through which the business will reach consumers are also evaluated, with the most appropriate format of the marketing (also called sales) funnel being content marketing (Content Marketing).
Middle of Funnel (MoFu) is the middle part of a marketing funnel. At this middle level of the funnel, the goal is to inform the user through content how the product or service can solve their problem. In this phase, the business must prepare the consumer for its offer. In this phase, the brand delivers to him what he promised him at

the cost of his attention, sample content being an e-book, downloadable research report, interesting article, report, video training, etc.

Bottom of Funnel (BoFu) is the lower, narrowest part of the marketing funnel, in which the so-called conversions – mini (sales) and micro (leads) goals of the business are realized. In this phase, the offer becomes clear, on the basis of which the consumer can make a purchase decision. This happens most often through a value offer (webinar, demo, trial period, email, article, free consultation), advertising (remarketing).

This classic 3-level marketing funnel model is important to businesses because it provides a structured approach to marketing and sales strategies, enabling managers and marketing professionals to plan and implement campaigns that effectively guide consumers through the various stages of the funnel, increasing return on investment (ROI) and customer loyalty.

The logical question arises: What are the benefits of using the marketing funnel for agribusiness?

The marketing funnel has some benefits for agribusiness, such as:

1. Improve sales leads – by using the marketing funnel, businesses can attract new customers and increase sales leads for their products or services.

2. Increase the effectiveness of marketing campaigns – the marketing funnel allows businesses to analyze and determine the effectiveness of their marketing campaigns at each stage of the funnel. This helps them adjust their strategies and improve results.

3. Improve user experience (UX) – the marketing funnel allows businesses to create personalized experiences for their potential customers by providing information that is fully tailored to the needs and preferences of each potential customer.

4. Informing potential customers – the marketing funnel allows businesses to inform their potential customers about their products and services by providing enough information about them at each stage of the funnel. This helps them prepare their customers and give them the information they need to make the right decision.

5. Create loyal customers – the marketing funnel allows businesses to create loyal customers by providing experiences that meet customer needs and preferences. This helps establish a long-term relationship with customers and ensure repeat sales in the future.

3. Key tools and components in developing the digital content marketing strategy – marketing funnel and customer journey

The marketing funnel and the customer journey are two tools that are often used interchangeably in the context of developing digital content marketing strategies by businesses. These tools describe the process consumers go through from initial exposure to the brand and/or product to final purchase and subsequent engagement. It is important to understand that these processes are not static, but dynamic and evolve over time, meeting the needs of users and helping to achieve the business goals of organizations.

Understanding and properly implementing the marketing funnel and customer journey are critical to the success of modern marketing strategies. These processes help organizations not only attract new customers, but also convert them into loyal followers and brand ambassadors. Adaptability and the ability to integrate different marketing channels and techniques are key to building an effective relationship with consumers in the long term.
Figure 3 presents a detailed overview of the consumer journey, which is equivalent to a marketing funnel, looking at how, at different phases of this journey, businesses interact with all consumers over time to move a potential customer from awareness to Brand Advocacy.

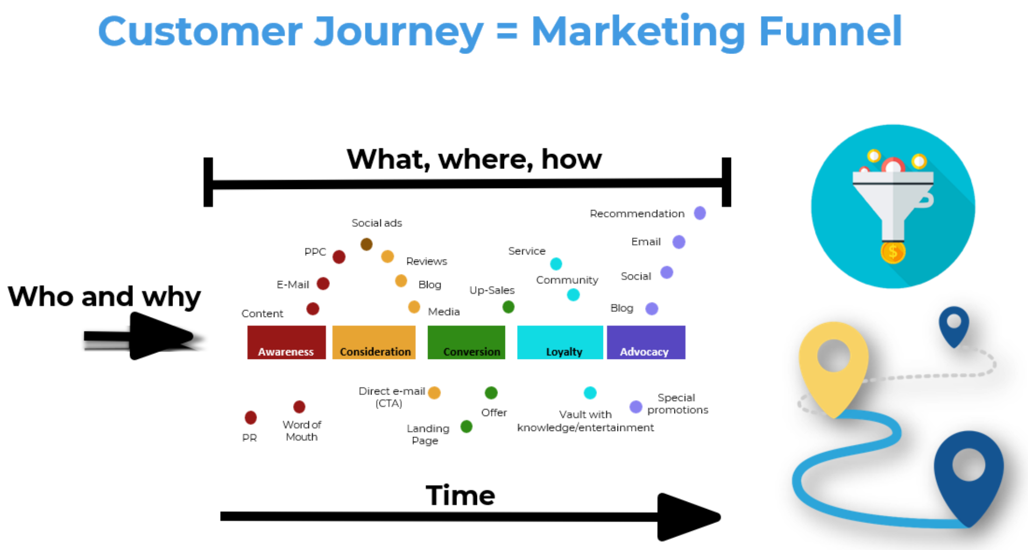

Figure 3. Key tools and processes in developing the digital content marketing strategy

Source: the author

Each phase includes specific channels and types of digital content that are aimed at fulfilling specific goals related to moving consumers through the funnel.
At the “Awareness” stage, consumers first become familiar with the brand or the products of the business. The goal is to attract attention and create a positive first impression. Digital content typically includes:

- *Social ads;*
- *PPC (Pay-Per-Click) Ads;*
- *E-mail marketing;*
- *Content;*
- *PR (Public Relations);*
- *Word of Mouth.*

Through these channels, the brand is presented to the audience and awareness of basic information about the products and services of the business is generated.
In the second stage, “Consideration”, consumers evaluate products or services and compare them with others on the market. The content here is more detailed and informative and includes:

- *Direct email;*
- *Landing Pages;*
- *Blog posts;*
- *Social media content.*

Tactics aim to convince potential customers of the benefits of your offer and guide them to the next stages of purchase.
In the third stage of “Conversion”, users make a purchase decision. The content and actions of the business are focused on facilitating the purchase process:

- *Special offers;*
- *Optimized sales pages;*
- *Loyalty Programs.*

In the fourth stage “Loyalty”, businesses seek to retain customers by getting them to buy from them regularly through special loyalty programs and special promotions for loyal customers. Content is aimed at retaining the customer and increasing their engagement and satisfaction.
At the last stage of “Advocacy”, the culmination of the consumer journey occurs, where satisfied customers actively promote the brand through:

- *Referral programs;*
- *Social media and email campaigns to share customer stories.*

The goal is to turn loyal customers into brand ambassadors who help attract new customers through their referrals.
By understanding how each phase and its associated digital content work together, businesses can effectively manage the consumer journey and optimize their marketing efforts to achieve maximum results.

3.1. Digital content strategies at every stage of the marketing funnel/customer journey

In digital marketing, there are three stages that represent the buying process of consumers through the marketing funnel:[1]

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[1] *Explanation:* These three phases in digital marketing are generally accepted in the marketing community and can reveal many studies and articles, discussing various aspects on these phases, without yes this is the only definitive source for the technology's origin; Those same things were turned into standard terms during marketing discussions, reflecting a consensus, splitting off the misleading leadership into a single researcher or professional.

- *Stage 1 includes all the activities and processes that happen to the user before the purchase – publications in the media, articles, free products, videos, etc.;*
- *Stage 2 includes everything that happens to the user during the purchase – special offers, emails, service, site, speed, etc.;*
- *Stage 3 includes everything that happens to the user after the purchase – emails, calls, care, feedback, gifts, attention, etc.*

Different digital content strategy components can be used at each stage. In the first stage of the pre-purchase marketing funnel, the components of the funnel are divided by types of activities and tools used to engage customers. This pre-sale stage is important for building awareness and interest in the brand, and for stimulating consideration of the purchase of the product or service. The main goal of this stage is to create a large base of informed and interested audience that will be prepared for the next stages of the marketing funnel, such as consideration and conversion. Every strategic action and every tool are chosen to reinforce the brand's position and encourage future customer engagement.

All business activities and tools are aimed at informing and attracting potential customers. These are:[1]

- **Generate engaging content by:**
  - *Organizing events* is an effective way to directly engage with potential customers, giving them the opportunity to experience the brand firsthand.
  - *Publications of articles in the media and blogs* provide useful information that helps consumers understand more about products and services, as well as gain insight into businesses and products.
  - *YouTube video content* to showcase products or services in a way that text and images cannot, thus creating a stronger visual connection to the brand.
  - *Using podcasts and hosting webinars*, as these platforms allow for brand-related topics and provide the audience with real-time learning and engagement opportunities.
- **Using advertising channels and tools through:**
  - *Organic (unpaid) search* – search engine optimization (SEO) helps content to be found by users easily in search results, which increases brand visibility.
  - *Email marketing* – sending direct emails that are highly personalized and aim to keep in touch with potential customers by informing them about new products, offers or events.
  - *Display and Video Ads* – these ads are aimed at attracting attention through attractive visual elements and can be placed on various platforms online.

[1] Lemon, K. N., & Verhoef, P. C. (2016). Understanding Customer Experience Throughout the Customer Journey. Journal of Marketing, 80(6), 69 – 96. available at https://pure.rug.nl/ws/files/81733365/Understanding_Customer_Experience_Throughout_the_Customer_Journey.pdf, visited on 08.09.2024.

- *PPC (Pay-Per-Click)* are paid advertisements that provide precise targeting to specific user groups and the ability to quickly test different messages.
- *Social media ads (Facebook and Instagram)* - these platforms offer powerful targeting tools and interaction capabilities that can help brands reach a significantly larger audience.

In the second stage of the marketing funnel at the time of purchase, the key strategic components of the marketing funnel are used to optimize the customer experience and increase sales. The second phase of the marketing funnel covers everything that happens to the consumer during the purchase, including special offers, emails, customer service, websites and speed of service:[1]

- *Sales pages (Landing Pages)* are important for business because they are most often the first point of contact between the potential customer and the offered products or services. These pages should be optimized for conversion, providing clear and attractive information that makes it easy for the user to make an informed choice and drive them to purchase.
- *Offers (Up-sells, Down-sells, Cross-sells)*

Upsells are tactics where customers are offered improved versions of a selected product in order to increase the value of their purchase. Down-sells are offered when a customer turns down a more expensive product, offering them a cheaper but still suitable option. Cross-sells are product offers that complement or are related to the main product the customer intends to buy.

- *Webinars and demos*

These tools allow businesses to provide more information about their products or services in a way that is engaging and interactive. Webinars can include live product demonstrations, helping customers better understand the offerings and increase their confidence in the purchase.

- *Thank You Pages and emails*

Thank You Pages and follow-up emails play an essential role in improving the customer experience by notifying customers of the status of their order and providing additional information or promotions. These tools are important for maintaining customer communication and encouraging repeat purchases.

- *Consultations and trial periods*

Providing professional advice and opportunities for trial periods can significantly increase customer confidence and convince them of the value of the product or service. These strategies are particularly effective in the agricultural industry, where products require greater investment or deeper understanding.

[1] Lemon, K. N., & Verhoef, P. C. (2016). Understanding Customer Experience Throughout the Customer Journey. Journal of Marketing, 80(6), 69 – 96. available at https://pure.rug.nl/ws/files/81733365/Understanding_Customer_Experience_Throughout_the_Customer_Journey.pdf, visited on 08.09.2024.

Each of these strategic components of Stage 2 aims to optimize the customer experience during purchase by facilitating the process, improving satisfaction and maximizing conversions. Managing these components in an effective manner can significantly impact the success of a business.

In the third stage of the post-purchase marketing funnel, the focus is on the activities and processes that occur after a consumer makes a purchase. This stage is extremely important for maintaining a high degree of customer loyalty, driving repeat purchases and turning customers into brand ambassadors. Each of these strategic components at this final stage aims to enhance positive brand perception and extend the life of customer relationships. Here's a more in-depth look at each:[1]

- *Phone call* – by making a personalized call to the customer after a purchase can significantly increase satisfaction and provide an opportunity to collect feedback. It also shows customers that their opinion is valued by the business.
- *Gifts* – sending gifts or samples of new products can be an effective way to build and strengthen the relationship with customers.
- *Emails* – regular email communication helps keep the brand in the minds of customers and inform them about new products, promotions or events.
- *Loyalty programs* – creating loyalty programs that reward customers for their repeat purchases is an excellent way to foster long-term relationships.
- *Discount coupons* – offering discount coupons for future purchases can encourage customers to continue shopping with the business.
- *Events* – invitations to special events can strengthen the community around the brand and give customers the opportunity to personally participate in the brand's organizational culture.
- *Digital community around the brand* – engaging with customers through online communities or forums can deepen relationships and enable the exchange of ideas and opinions.
- *Referral programs* – incentivizing customers to recommend your products or services to others can expand your customer base and increase business sales.
- *Affiliate programs* – the creation of affiliate programs allows third parties to promote the business's products in exchange for a commission, which can expand the reach of the brand.

Each of these strategic post-purchase components is essential to creating value for customers and strengthening their loyalty to the brand and the business. Effective use of these components can turn one-time buyers into repeat customers and active

[1] Lemon, K. N., & Verhoef, P. C. (2016). Understanding Customer Experience Throughout the Customer Journey. Journal of Marketing, 80(6), 69-96. available at https://pure.rug.nl/ws/files/81733365/Understanding_Customer_Experience_Throughout_the_Customer_Journey.pdf, visited on 08.09.2024.

brand ambassadors who share their positive experiences with others, increasing business success and growth over time.

4. Conclusion

In conclusion, it can be emphasized that digitization plays a key role in the transformation of agrarian business. Developing and implementing digital content strategies is critical to building and strengthening customer relationships and increasing customer engagement throughout all stages of the marketing funnel.

The conclusions to be drawn based on the analysis in the report are:

- *Impact of digital content* – the report highlights that digital content significantly influences consumer decision-making in the agricultural sector. It helps increase customer awareness and engagement, leading to higher conversion and loyalty.
- *Integration of marketing strategies* – the development of coherent marketing strategies covering the different stages of the consumer journey is essential for the success of an agrarian enterprise. This includes adapting to specific customer needs and preferences at every step.
- *Role of digital technologies* – the implementation of new technologies and content digitization platforms offers significant opportunities for innovation and personalization, which further increases customer satisfaction and operational efficiency.

The recommendations to be made based on the analysis in the report are:

- *Expanding digital channels* – agribusinesses must continue to expand their digital content access channels to ensure broad accessibility and personalization for consumers.
- *Investment in analytics tools* – to optimize digital content strategies, it is important to invest in analytics tools that allow tracking of user behavior and return on investment (ROI) of marketing campaigns.
- *Training and development of the staff of the agrarian enterprise* – it is also important to invest in training and development of the staff for the management of digital technologies and content, which will improve the competencies and ensure the successful implementation of the presented strategic components of the marketing funnel.

The report makes clear that agribusinesses that actively implement and optimize their digital content strategies can significantly increase their competitiveness and achieve long-term growth and success in a changing economic environment.

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DOI: https://doi.org/10.37075/idara.2024.20

CONSUMER PREFERENCES FOR DRIED APPLES OF CULTIVAR FLORINA

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Abstract
Regarding the World Health Organization's prescription to consume more fruits and vegetables to make people healthier, the article gives particular consideration to consumers' preferences about fruit consumption. In the study, apple fruits of the cultivar Florina were chosen. The type of fruits that respondents should rate in the study were dried. Four apple drying methods were used: in sun, in shade, in dehydrator, and in lyophilizer. The study found that freeze-dried apples are the most preferred, followed by those in a dehydrator and sun. These types were also rated highest in taste, while shade-dried fruits were rated negatively. According to the respondents, dried apples of the cultivar Florina can be consumed year-round; they are healthy and suitable for young children and diabetics and do not have added sweeteners. In addition, freeze-dried apples resemble fruit chips, they are crunchy and have a nice, unchanged color. Regarding consumers' willingness to purchase dried Florina apples, it was found that consumers are willing to pay the most for dried apples between BGN 1 and BGN 2. In contrast, the apples dried in a lyophilizer were rated higher over BGN 5. As a result of the study, it can be summarized that each consumer's taste is different. Also, each type of dried fruit has different consumer groups. The most preferred types include dried apples in a lyophilizer, dehydrator, and sun.
Key words: apple, drying methods, consumer behavior, willingness to pay
JEL*:* Q10, Q13

Introduction

Apples (*Malus domestica* Borkh.) are an essential part of a healthy human diet. They are a source of valuable nutrients such as carbohydrates, phenolic compounds, pectin, antioxidants, dietary fiber and minerals. Consumption of different varieties of apples contributes to improving human health by reducing the risk of cardiovascular diseases and cancer (Petkova et al., 2019).
China is the world's largest apple producer, with an annual production of 47573200t in 2022 (FAO Stat, 2022). The leading apple producers are Turkey, USA, Poland, India, Russia, Italy, Iran, France, and Chile. At the national level, apple production is 34933t, with 3562ha of harvested areas in 2023 (MZH, 2024). At the regional

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level, the South-Central Region (1370ha) has the most apple harvested areas and, accordingly, the largest amount of apple harvested production (11752t).

Consumer behavior as a part of human behavior is focused on the sphere of consumption, which is expressed in the consumer process of searching, buying, and using the goods (Atanasov, 2020). According to some authors (Naim, 2023), four factors determine consumer behaviour: personal, psychological, social, and cultural. Other authors (Pirvutoiu and Popescu, 2013) have also argued that socio-economic factors influence consumer behavior, and third authors (Zlatanova-Pazheva, 2024) have also argued that personal, situational, and technological factors also play a role.

Also, in some articles have studied consumers' perceptions of organic foods as factors related to a healthy lifestyle and good health (Vasileva et al., 2014). According to other authors, achieving a higher level of consumer understanding and beliefs through consumer awareness is important, which is a key factor in determining market behavior and developing the market for organic products (Dzhabarova, 2011).

Prodanović et al. (2023) identified the factors influencing the behavior of Serbian consumers when buying apples by examining the frequency, the place of purchase and others. In the research was found that the most important factors influencing the decision to buy apples are taste, freshness, health impact, product quality and origin. In the study, some consumers prefer imported apples because of their better availability and appearance.

At the national level, consumers' attitudes towards purchasing Bulgarian and imported fruits and vegetables have been analyzed (Slavcheva, 2014). The research found that the leading factors in consumers' choice of fruits and vegetables are quality and price. However, the producers and convenience of shopping are also important for consumers. Also, consumers evaluate Bulgarian products as being of better quality than imported ones, but when the quality and price change, they tend to buy imported fruits and vegetables.

The study aims to evaluate consumers' preferences regarding consuming dried apple fruits of cultivar Florina. The research provides information on consumer behavior regarding consumers' preferences for consuming dried apples and their willingness to pay.

Methodological framework

The methodological part includes drying methods, questionnaires, analysis of consumer preferences, and recommendations based on the results.

In the study, the apple fruits were harvested from the experimental plantation at the Institute of Agriculture – Kyustendil in 2023. Before drying, the fruits were washed, cleaned, weighed and cut into slices 0.5-0.7 cm thick, which were not treated with acid before drying. The drying methods – in sun, shade, and dehydrator were applied at the Institute of Agriculture – Kyustendil, and freeze-dried method was applied at the Institute of Cryobiology and Food Technologies – Sofia (Figure 1).

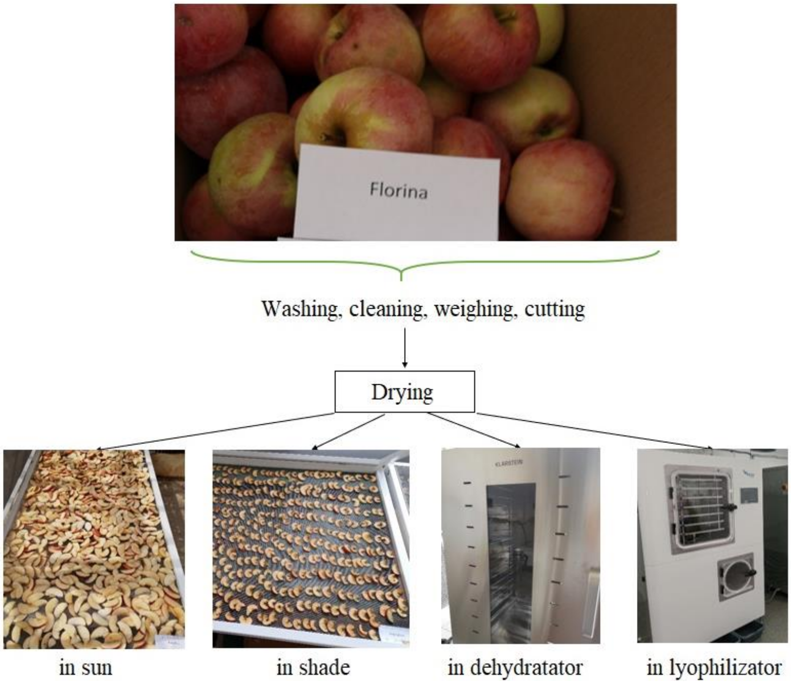

Figure 1. Preparation and drying methods

The sun-dried and shade-dried fruits were dehydrated at 13°C average daily temperature and 75% average air humidity during the studied period. The fruits dried in dehydrator "Klarstein Master Jerky 16" with a heat output of 1500 W were dried for 24 h per 1 kg at a temperature of 70°C. The fruits that were dried in the "Hochvakuum-TG – 16.50" lyophilizer were dried for three days per 1 kg under the following conditions: freezing of the native product at a temperature of –25°C, sublimation at –25/–35°C under deep vacuum, and heating under deep vacuum, at temperatures from +25°C to +35°C. The apples were washed, cleaned, weighed, and cut into 3 cm thick slices in this method.
The survey was conducted in 2024 in the South-West region of Bulgaria, including the districts of Blagoevgrad, Kyustendil, Pernik, Sofia, and Sofia-capital. face-to-face. The survey card was conducted face-to-face among consumers in each of the districts.
The main section of the questionnaire consists of six questions. Two of the questions ask about consumer preferences for consuming dried fruits, two assess the

visual and flavour characteristics of dried apples from the cultivar Florina, and two are aimed at consumers' willingness to pay for the purchase of different dried apples. Additionally, three questions are provided to identify the demographic features of each user.
The study included 215 participants, with 50.2% female and 49.8% male. The age categories 18 – 29 and 30 –39 have the highest percentage of survey participants (36% and 35%, respectively), while those over 50 have the lowest percentage (8%).

Results and discussion
Regarding the questions in the main part of the survey, it was found that 67% of respondents consumed dried fruit, with apples being the most preferred, followed by plums, pears, apricots, raisins, and sweet cherries (Figure 2).

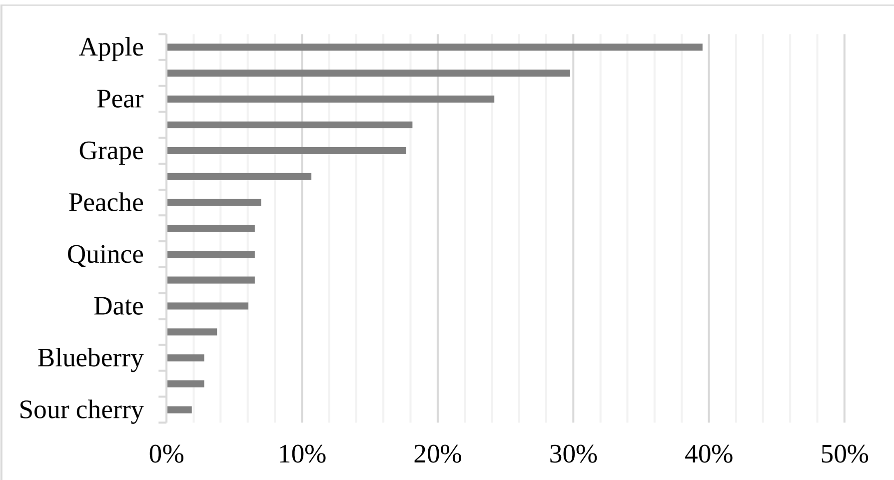

Figure 2. Fruit dried preferences

In the study, respondents rated the appearance of dried apples (Figure 3), with lyophilized apples being the most desired (79%), followed by those dried in dehydrator (56%), and those dried in sun (46%). The respondents did not rank shade-dried apples highly.

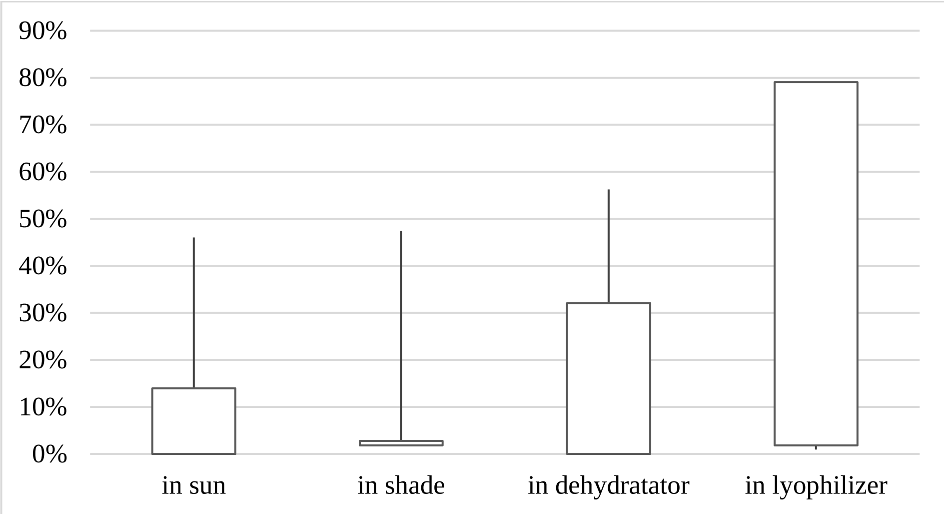

Figure 3. Degree of preference for appearance of the dried apple fruits Florina

In terms of flavour (Figure 4), consumers choose lyophilized apples (60%), followed by dehydrated apples (46%), and sun-dried apples (39%). The respondents assessed shade-dried apples as having the worst taste (41%).

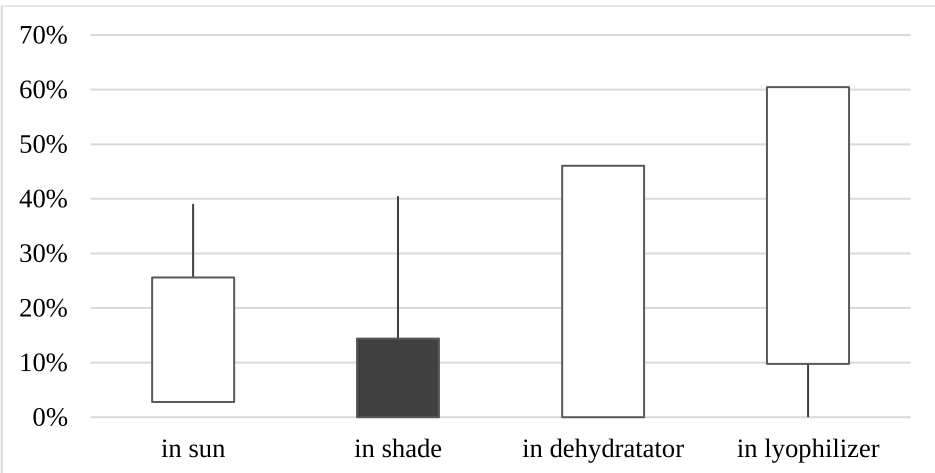

Figure 4. Degree of preference for flavor of the dried apple fruits Florina

Generally, consumers share that Florina dried apples are suitable for people with diabetes. In their opinion, each dried apple is different but well-liked. Also, the consumers' feedback is that dried apples can be eaten year-round.

Regarding freeze-dried apples, consumers share that they look like fruit chips, and they are more acidic than the other dried apples. Also, they are crunchy, have a nice, preserved color, taste, and shape, look natural, healthy, and suitable for small children without added enhancers and colorings, and retain their taste qualities. However, some consumers consider them dry and fake. Also, freeze-dried apples were defined as strange and even totally different products from other dried apple types. In addition, the respondents shared those freeze-dried apples should have a higher price, but they are not available by the retailers. Also, the freeze-dried apples can be used as fruit flour for various sweets in the food industry.

Regarding dehydrator-dried apples, consumers report that they are liked, tastier than sun-dried and shade-dried apples, suitable for eating, sweeter and softer than other types, and better preserved as dried apples that have passed through hot air. They are edible and can be eaten all year round. While other consumers share that they were drier and difficult to chew.

In terms of sun-dried apples, consumers share that they are also liked, they have normal sweetness, preserved organoleptic indicators, naturally dried, and soft texture. Another part of consumers says that they are tasteless than freeze-dried apples, lack sweetness, drier, and difficult to chew.

Consumers report that shade-dried apples are juicier than those dried in the sun but lack sweetness, darkened, difficult to chew, and tasteless.

Considering all comments in the study, it can be summarized that every consumer's taste is different. Dried apples in lyophilizer, in dehydrator and in sun can be singled out as more preferred.

Also, in the study was assessed consumers' willingness to pay a specific price for 100 g of dried Florina apples (Figure 5). It was found that a big share of consumers is willing to pay between BGN 1 and BGN 2 for dried apples in sun and shade (90%). For dehydrator-dried apples, consumers would pay between BGN 2 and BGN 5 (81%), a higher price than previous apple types. The study established that consumers most commonly would also pay the highest price from BGN 5 for freeze-dried apples (46%). In the study, it was established that consumers from Sofia-capital and Sofia-district are willing to pay a much higher price for freeze-dried apples than consumers in the other researched areas.

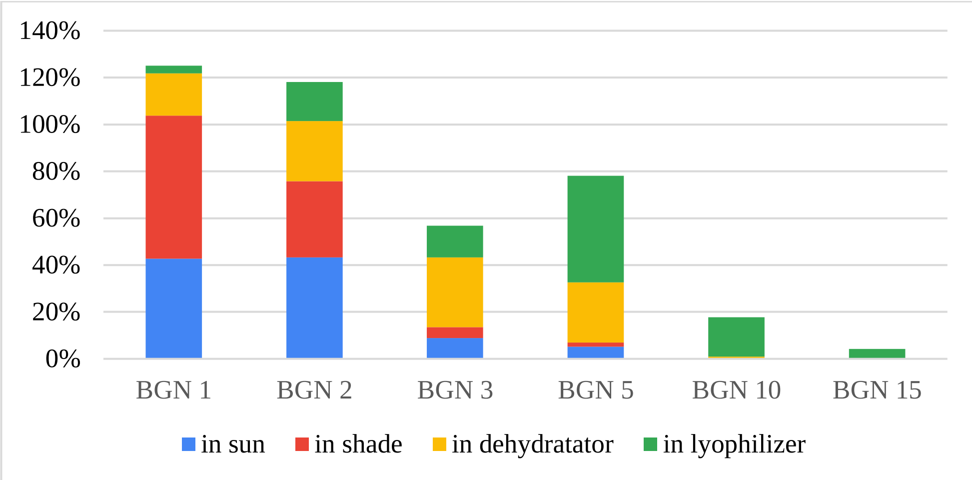

Figure 5. Consumer willingness to pay for different dried apple fruit Florina

In addition, a set of recommendations was made based on the results. In compliance with the World Health Organization's recommendations for a healthier lifestyle, consumers are encouraged to consume more fruits and vegetables. This is the reason that the study pays special attention to the preferences of end consumers regarding fruit consumption. As a result of the study, recommendations were made to consumers to consume fresher and dried fruits. As for dried fruits, they should be dried without added sugars to be natural and healthier. Also, different methods can be applied in drying, each of which has advantages. According to consumers, price was also a determining factor in their willingness to pay, with consumer attitudes proving to be a determining factor.

Conclusion

The study found that freeze-dried apples were most preferred, followed by those dried in dehydrator and sun. In terms of flavor, freeze-dried apples are also the most highly rated, followed by those dried in dehydrator and sun. The shade-dried fruits were evaluated negatively in terms of flavor.

The respondents liked the dried apples of the cultivar Florina. It was found that dried apples are generally suitable for people with diabetes and can be consumed all year round. Also, freeze-dried apples have been likened to fruit chips, which they are more acidic than other dried apples. Also, they are crunchy, have a nice and unaltered color. Advantages of all Florina dried apples are that they are healthy, suitable for young children, and have no added sweeteners.

Regarding consumers' willingness to purchase Florina dried apples, they were found to be willing to pay the best price between BGN 1 and BGN 2, while freeze-dried apples were assessed at a higher price of BGN 5.

According to the findings, each consumer's taste is unique, and there are distinct consumer groups for each kind of dried apple. However, dried apples made in lyophilizer, dehydrator, or sun can stand out as more preferred.

Acknowledgements
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SCENARIO ANALYSIS TO INVESTIGATE THE EFFECT OF IMPLEMENTING COMPENSATORY PAYMENTS FOR REDUCING WATER EROSION IN BULGARIA

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NIKOLOV, DIMITAR[2]

Abstract
Soil degradation due to water erosion presents a critical challenge with far-reaching economic and environmental implications. This article focuses on strategies to enhance the efficacy of agro-ecological interventions aimed at mitigating water erosion. The Strategic Plan for Agriculture and Rural Development in the Republic of Bulgaria for the 2023 – 2027 period outlines specific measures, including the "Eco Scheme for Preservation and Restoration of Soil Potential" and the "Eco Scheme for Ecological Maintenance of Permanent Plantations," to address this issue. For the purposes of this analysis, in addition to the size of compensatory payments, an indicator of the economic value of reduced water erosion is introduced. Three scenarios are simulated, each varying the size of agro-ecological payments. They are contingent upon specific outcomes achieved in reducing water erosion. The agri-environmental payments from the CAP 2023 – 2027 are tied to agricultural practices and are influenced by both the compensatory payment amount and the agricultural area. In the three scenarios considered, additional indicators include the economic value of reduced soil erosion and the extent of soil erosion reduction attributable to agro-ecological payments. For the purposes of this analysis, seven distinct crop farms located in the Blagoevgrad district were selected. The analysis revealed the necessity for differentiating compensatory payments based on the size of the farms and the specific outcomes achieved. Land degradation is a significant threat to sustainable development, particularly in Southern European countries (Barbayiannis et al., 2011). Farmers, primarily focused on their business operations and profit maximization, often lack awareness or concern for various environmental issues (Taguas and Gómez, 2015). Through their agricultural practices, farmers exert both positive and negative impacts on various processes that not only affect their own farms but also have broader implications for society and ecosystems. The adoption of effective management practices and investments in soil health protection plays a significant role in achieving balance in these processes. This approach leads to a reduction in soil erosion and degradation, enhances water retention, and helps prevent or mitigate the effects of natural disasters: landslides and floods etc. As a result of their activities, farmers have developed various protective systems in mountainous and semi-mountainous areas, where agricultural conditions are more challenging. The construction of stone walls, terracing, and other such elements by engaged farmers provides essential measures for reducing surface erosion and preventing landslides (Agnoletti et al., 2011). Soil erosion is a phenomenon, associated with a series of natural and/or anthropogenic processes of detachment and transfer of soil particles by wind, rain and irrigation waters (Rousseva, 2008).
Keywords: agriculture, agri-environmental payments, water erosion, scenario analysis
JEL: Q15, Q18

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1. Introduction

Agroecological measures are designed to support a range of conservation activities and to either promote or restrict certain agricultural practices. Examples include altering plowing regimes, utilizing cover crops, implementing various conservation techniques, etc. The European Union has introduced agro-environmental measures to mitigate the negative environmental impacts of conventional agriculture. The measures implemented under the CAP 2014 – 2020 have proven insufficient in generating significant environmental benefits, such as reducing soil erosion, etc. (Früh-Müller et al., 2019). By modeling various approaches and introducing new or improved tools to achieve specific environmental outcomes, the efficiency in the allocation of public funds can be enhanced. The analysis examines the introduction of compensatory payments based on simulated results from several farms of varying sizes located in the Blagoevgrad district. This region is notable for its favorable climatic conditions, which support the cultivation of cereals, vegetables, and perennial crops, including vines.

Soil loss resulting from water erosion is a significant environmental issue that incurs economic losses of approximately $20 billion annually in the EU (Panagos et al., 2015). This soil loss is unevenly distributed across regions, with 70% occurring in mountainous and hilly areas, which comprise only 10% of the EU's land area (Barbayiannis et al., 2011). This issue is also prevalent in Bulgaria, impacting a significant portion of the country's territory. Figure 1, titled "Actual Risk of Sheet Water Erosion of Soil," presents data from the 2021 report by the Executive Environment Agency.

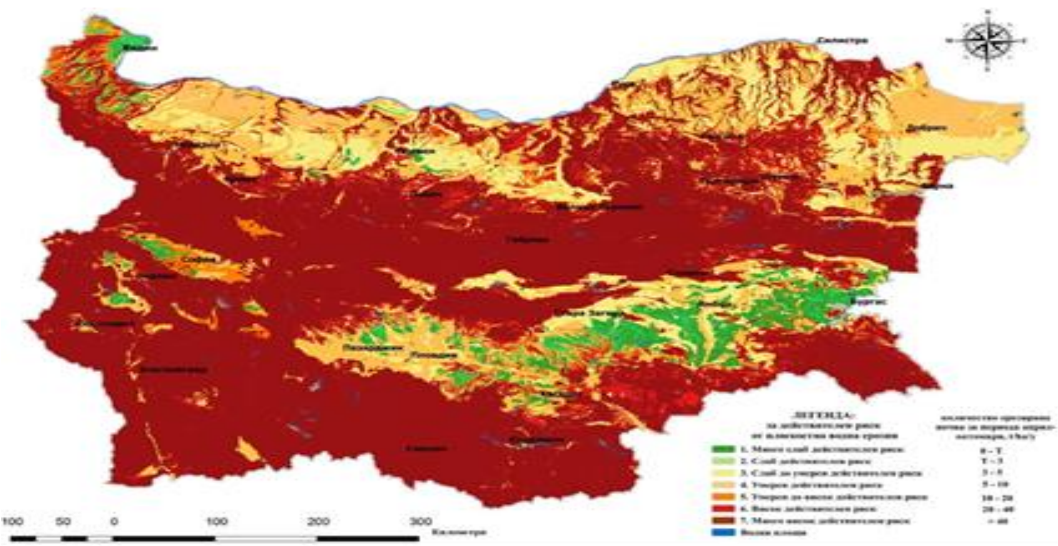

Figure 1. "Actual Risk of Sheet Water Erosion of Soil"

Source: IAES, Report for 2021

This research aims to enhance the effectiveness of agro-ecological measures by evaluating their impact on reducing water erosion. The current Strategic Plan for Agriculture and Rural Development of the Republic of Bulgaria for the 2023 – 2027 period incorporates agro-ecological measures based on agricultural practices implemented by farmers to mitigate water erosion. Three scenarios have been developed to analyze two eco-schemes from the Strategic Plan. In these scenarios, agro-ecological payments are determined by the amount of compensatory payments, the agricultural area involved, the economic value of reduced soil erosion, and the extent of soil erosion reduction due to the agro-ecological payments. In the first scenario, compensatory payments are set to match the indicative rate under the "Eco Scheme for Preservation and Restoration of Soil Potential" and the "Eco Scheme for Ecological Maintenance of Permanent Crops." In the second and third scenarios, these compensatory payments are adjusted by increasing and decreasing them by 50%, respectively. The mathematical model incorporates both low and high indicators of the economic value of reduced soil erosion in all three scenarios. These scenarios facilitate the investigation of how compensatory payments for a given area correlate with indicators of the economic value of reduced soil erosion and the extent of soil erosion reduction achieved through agro-ecological payments. The three scenarios are tested across seven agricultural holdings in the Blagoevgrad region.

2. Methodology

This study employs scenario analysis and a mathematical model to determine the amount of agro-ecological payments. The model is based on the "CONSOLE" project, "Simulations and Implementation of New Contractual Solutions" work package (Olivieri et al., 2019). Water erosion affects the largest area in Bulgaria: about 65% of all arable land (Rousseva, 2008).

A mathematical model is utilized to simulate farmer behavior. This approach not only considers the size of the compensatory payment and the area of the farm declared under agro-ecological measures but also incorporates indicators of reduced soil erosion resulting from agro-ecological payments (δaes) and the low and high economic value of reduced soil erosion (V). The agro-ecological payment is calculated according to the following formula:

$$AESt = (P*K1) + (V * \delta aes) \tag{1}$$

where:

- $AESt$ is the total agro-ecological payment.
- P is the area of the holding declared under agro-ecology, in hectares (ha).
- $K1$ is the amount of compensatory payment, in BGN per hectare (BGN/ha).

- V is the economic value of reduced soil erosion, in BGN per ton per hectare per year (BGN/t/ha/year).
- δaes is the amount of reduced soil erosion due to the agro-ecological payment, in tons per hectare per year (t/ha/year).

The potential impact of agro-ecological measures and schemes will be assessed by comparing the contribution to erosion reduction between farms that have made commitments and those that do not participate in agro-ecological schemes. The reduced soil erosion due to agri-environmental payments is calculated using a general formula. It is the difference between:

$$\delta aes = Sp_1 - Sp_0 \tag{2}$$

where:

- Sp_1 is the annual potential erosion of a farm that has committed to agro-ecological actions aimed at reducing soil erosion.
- Sp_0 the annual potential erosion of the farm without any environmental commitments.

This mathematical model enables the integration of compensatory payments per area with specific indicators for water erosion: V and δaes. Two schemes from the CAP 2023 – 2027 are incorporated: the “Eco Scheme for Preservation and Restoration of Soil Potential,” which promotes green fertilization, and the “Eco Scheme for Ecological Maintenance of Permanent Plantings,” which involves weeding the interrows. The indicative rates, according to the adopted Strategic Plan for the development of agriculture in Bulgaria, are BGN 223.33/ha for perennial crops and vineyards, and BGN 130.31/ha for annual crops. The following three scenarios are developed to determine the size of compensatory payments:

- **First scenario:** The compensatory payment amount is assumed to be identical to the indicative rate under the two applied eco-schemes, as outlined in the Strategic Plan for the Development of Agriculture in Bulgaria for 2023 – 2027.
- **Second scenario:** The compensatory payment amount is increased by 50%.
- **Third scenario:** The compensatory payment amount is reduced by 50%.

For each of the three scenarios, both low and high economic values of reduced soil erosion are tested.

The Report on the State of Soils for the Period 2005 – 2019 (IAES, 2021) determines various parameters for the average annual intensity of water erosion. For arable land where agro-ecological activities have been implemented, the erosion rate is 11 t/ha/year, compared to 21 t/ha/year for land without such activities. For the purposes of the study, the reduced soil erosion due to agro-ecological payments is assumed to be 10 t/ha annually.

In the Report on the Structure of Agricultural Holdings in Bulgaria (MZHG, 2021) for the 2019 campaign, the average farm size in the Blagoevgrad district is determined to be 14.37 ha. Additionally, based on the criteria used for defining the agricultural area and the structure of farms, they are categorized by size as follows:

- **Very small farms:** 1 to 5 ha
- **Small farms:** 5 to 30 ha
- **Medium farms:** 30 to 650 ha
- **Large farms:** 650 to 1500 ha
- **Very large farms:** Over 1500 ha

In the research, the selection and inclusion of the Blagoevgrad district were based on the following factors:

- Exposure, hydrogeological instability**,** rural farming practices, soil erosion issues:
- The area is intra-territorial, characterized by a very high actual risk of sheet water erosion, as indicated in the National Status Report on Environmental Protection in the Republic of Bulgaria for 2021.

For the purposes of this study, only very small, small, and medium-sized farms with a plant-growing specialization are considered. These farms primarily cultivate cereal crops, vegetables, perennials, and vineyards. They represent the majority of farms in the Blagoevgrad region. Data on these farms are summarized in Table 1, "Characteristics of the Studied Farms".

Table 1. "Characteristics of the Studied Farms"

Farm	Area under agroecological commitment, ha	Specialization	Size
1	1,80	perennial crop	Very small
2	35,0	cereals	Medium
3	2,30	vineyards	Very small
4	25,00	cereal grain	small
5	3,20	perennial crops	Very small
6	4,50	perennial crops	Very small
7	18,00	vegetables	small

Source: author's research

3. Scenario Analysis

To implement the three scenarios, simulations are conducted to calculate three different amounts of agro-environmental payments, using Formula 1. Two levels of economic value for reduced soil erosion are determined for this purpose. The scientific literature reports average soil erosion costs of approximately 50 – 60 €/t/year

(Panagos et al., 2015; Telles et al., 2011). However, there is significant variability, with estimates ranging from as low as 3 € to as high as 300 €/t/year (Panagos et al., 2015). In the developed scenarios based on the achieved results, two values for the unit benefit (V) are used for the study: a low value of 45 BGN/t/year and a high value of 90 BGN/t/year. The other key indicator considered is the reduction in soil erosion due to agro-ecological payments. For the purposes of the study, the reduction in soil erosion due to agro-ecological payments (δaes) is assumed to be 9.7 t/ha/year. Each of the three payment scenarios involves a different amount of compensatory agro-ecological payment (K).

3.1. First Scenario

In the first payment scenario, the indicative rates from the "Eco Scheme for Preservation and Restoration of Soil Potential," which promotes green fertilization, and the "Eco Scheme for Ecological Maintenance of Permanent Plantings," which involves weeding of the rows, are adopted for research purposes. According to the adopted Strategic Plan for the Development of Agriculture in Bulgaria 2023 – 2027, compensatory payments are set at BGN 223.33/ha for permanent plantations and vineyards, and BGN 130.31/ha for cereal crops and vegetables. Two indicators are introduced: low and high economic value of reduced soil erosion (V) and reduced soil erosion due to agro-ecological payments (δaes). Summary data are presented in Table 2, "Agro-Ecological Payments According to Indicative Compensatory Rates."

At a low economic value of reduced soil erosion, only Farm 1 shows a negative amount of agro-ecological payments. The compensatory payments fail to cover the established water erosion indicators, despite the various agricultural practices implemented. This outcome may lead to Farm 1 opting out of future participation in similar eco-schemes. As a small farm, it does not meet the introduced low value of reduced soil erosion. When considering a high economic value of reduced erosion, Farms 3 and 5, in addition to Farm 1, are also unable to meet the established indicators. All of these farms are very small and primarily cultivate perennials, including vineyards. The amount of their agro-ecological payments is negative. Although Farm 6 has a positive amount, it is minimal. Given this level of compensatory payments and the economic value of reduced soil erosion, participation in such an eco-scheme would not be economically viable for very small farms. These farms may implement agricultural practices, but they will not meet the established water erosion indicators. As a result, they will either receive no agri-environmental payments or their payments will be too small to cover the expenses incurred. In contrast, all other agricultural holdings, including small and medium-sized ones, will experience a positive impact from their participation in such an eco-scheme. The benchmarks to be achieved are uniform across all holdings, regardless of their varying sizes.

This scenario demonstrates that the amount of agro-ecological payments received by farmers decreases as the economic value of reduced soil erosion increases.

Table 2. "Agri-environmental Payments According to Indicative Compensatory Payment Rates"

Results-based agri-environment payments					
Farm	Specialization – Eco Scheme	Area under Agroecology (ha)	Compensatory Payment (BGN/ha)	Size of Agroecological Payments (BGN)	
				Low Economic Value of Reduced Erosion (BGN)	High Economic Value of Reduced Erosion (BGN)
1	Perennial crops – EPPSS	1.80	223.33	-48.01	–498.01
2	Cereal grain – ECPPC	35.00	130.31	4110.85	3660.85
3	Vineyards – EPPSS	2.30	223.33	63.66	–386.34
4	Cereal grain – ECPPC	25.00	130.31	2807.75	2357.75
5	Perennial crops – EPPSS	3.20	223.33	264.66	–185.34
6	Perennial crops – EPPSS	4.50	223.33	554.99	104.99
7	Vegetables – ECPPC	18.00	130.31	1895.58	1445.58

Source: author's research

3.2. Second Scenario

In the second scenario, compensatory payments are increased by 50%. For farms growing cereals and vegetables, the payment will be BGN 195.47 per hectare, while for those cultivating perennial crops and vineyards, it will be BGN 335.00 per hectare. Table 3, titled "Agri-Environmental Payments with 50% Increased Compensatory Payment," summarizes the data. No farmer receives a negative amount of agro-ecological payments when a low economic value of reduced erosion is applied. Only Farm 1 and Farm 3, the smallest holdings, show negative agro-ecological payments at the high level of economic value of reduced erosion. However, these farms have no issues applying agricultural practices to address the low levels of soil erosion. Here as well, a decrease in agro-ecological payments to individual farmers is observed as the value of reduced erosion increases. However, for larger farms, this percentage reduction is smaller.

Table 3. "Agri-environmental Payments with 50% Increased Compensatory Payment"

Results-based agri-environment payments					
Farm	Specialization – Eco Scheme	Area under Agroecology (ha)	Compensatory Payment (BGN/ha)	Size of Agroecological Payments (BGN)	
				Low Economic Value of Reduced Erosion (BGN)	High Economic Value of Reduced Erosion (BGN)
1	Perennial crops – EPPSS	1.80	335	152.99	–297.01
2	Cereal grain – ECPPC	35.00	195.47	6391.28	5941.28
3	Vineyards – EPPSS	2.30	335	320.49	–129.51
4	Cereal grain – ECPPC	25.00	195.47	4436.63	3986.63
5	Perennial crops – EPPSS	3.20	335	621.98	171.98
6	Perennial crops – EPPSS	4.50	335	1057.48	607.48
7	Vegetables – ECPPC	18.00	195.47	3068.37	2618.37

Source: author's research

3.3. Third Scenario

In the third payment scenario, a 50% reduction in compensatory payments is applied for the purposes of the study. The payment amount varies based on the type of cultivated crop. For farms growing cereal crops and vegetables, the payment will be BGN 65.16 per hectare, while for those cultivating perennial crops and vineyards, it will be BGN 111.67 per hectare. Table 4, titled "Agri-Environmental Payments with 50% Reduced Compensatory Payment," summarizes all the data. At a low economic value of reduced erosion, Farms 1, 3, and 5 show negative agri-environmental payments. Farm 6, which also grows perennials, will receive a small payment under the low value of reduced erosion, despite the activities performed. All of these farms are very small. With a high economic value of reduced soil erosion, Farm 6 will also fail to meet the criteria and will receive a negative amount of agri-environmental payments.

Table 4. Agri-environmental Payments with 50% Reduced Compensatory Payment

Agri-environmental Payments Based on Results					
Farm	Specialization – Eco Scheme	Area under Agroecology (ha)	Compensatory Payment (BGN/ha)	Size of Agri-environmental Payments (BGN)	
				Low Economic Value of Reduced Erosion (BGN)	High Economic Value of Reduced Erosion (BGN)
1	Perennial Crops – ESCP	1.80	111.67	–249	–699
2	Cereal Crops – ESVP	35.00	65.16	1830.43	1380.43
3	Vineyards – ESCP	2.30	111.67	–193.17	–643.17
4	Cereal Crops – ESVP	25.00	65.16	1178.88	728.88
5	Perennial Crops – ESCP	3.20	111.67	–92.67	–542.67
6	Perennial Crops – ESCP	4.50	111.67	52.49	–397.51
7	Vegetables – ESVP	18.00	65.16	722.79	272.79

Source: author's research

4. Conclusion

The three analyzed scenarios of agri-environmental payments are related to the implementation of eco-schemes aimed at protecting soil from water erosion. In the current Strategic Plan for the Development of Agriculture and Rural Areas in the Republic of Bulgaria for the period 2023 – 2027, these agroecological measures are based on the agricultural practices implemented by farmers. This approach is not sufficiently effective in terms of public fund allocation. A shift to a new model is necessary, one that associates practices to specific, measurable outcomes. For the purposes of this study, indicators such as the economic value of reduced soil erosion and the actual reduction in soil erosion due to agroecological payments are introduced. Three scenarios were developed to analyze the "Eco Scheme for Preservation and Restoration of Soil Potential" and the "Eco Scheme for Ecological Maintenance of Permanent Crops." In all three scenarios, farmers not only apply specific agricultural practices but also simulate certain outcomes. Agri-environmental payments depend on both the agricultural area and the size of the compensatory payment. The mathematical model also incorporates the economic value of reduced soil erosion and the actual reduction in soil erosion due to agroecological payments. Three scenarios were developed for size of the compensatory payment, including low and high economic value of reduced soil erosion. Between all these indicators, as a result of the analysis, certain dependencies were derived.

The introduction of agro-ecological payments, combined with indicators that measure the effectiveness of reducing soil erosion, requires careful examination and research. There is a need to diversify the compensatory payment amounts and the economic value of reduced soil erosion based on the size of the farm. For many small farms, it is crucial to either increase the amount of compensatory payments or lower the performance indicators. For medium-sized farms, it may be feasible to raise the water erosion reduction targets or reduce the compensatory payments. This approach will enhance the efficiency of agro-ecological payments, leading to tangible results in reducing water erosion, optimizing public expenditure, and delivering agroecological public goods. It is essential to minimize the risk for individual farmers of potentially failing to meet the indicators set, despite the application of prescribed agricultural practices.

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PROMOTING SUSTAINABLE AGRICULTURAL PRACTICES IN AGRICULTURE

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Abstract
Modern agriculture faces many opportunities and challenges. In the future, the world population is expected to rise dramatically. This growing population places a demand for increased food production, which will lead to significant damage to the environment and natural ecosystems. For many years, conventional farming practices have been used in agriculture. As a consequence of a number of environmental risks, such as erosion, compaction, salinization, pollution, loss of biological biodiversity, the quality of agricultural soils is increasingly deteriorating.
In this regard, one of the possible solutions to overcome the negative consequences is to implement sustainable farming practices in agriculture. The new Common Agricultural Policy provides a number of instruments and measures aimed at supporting the agricultural sector. The main idea is to invest funds in promoting the implementation of sustainable practices, with the aim of limiting the use of pesticides and chemicals, while at the same time preserving the necessary nutrients, improving soil fertility, leading to efficient and sustainable management of agricultural lands and natural resources.
This report mainly aims to present some good sustainable agricultural practices implemented by farmers in agriculture. In connection with this, the following tasks are set: outline the role of the Common Agricultural Policy in the context of sustainable agriculture, present good examples of sustainable agricultural practices and, on this basis, derive the main benefits of their application in agriculture. The application of sustainable agricultural practices in agriculture leads to the mitigation of climate change impacts, stabilizes agro-ecosystems and increases their resilience. The protection of the environment and the conservation of natural resources are of priority importance for the production of healthy and safe food in order to improve living conditions in rural areas.
As a result of the conducted research, it is established that nature-saving practices provide a number of diverse ecological, social and economic benefits necessary to minimize the negative impacts on the environment. The new CAP lays the foundation for fairer and more sustainable agricultural farming models. Undoubtedly, the application of sustainable agricultural practices is one of the possibilities to achieve long-term sustainability of agriculture and contribute to stimulating the development of the rural economy on a regional, national and global scale.
Key words: sustainable agricultural practices, Common Agricultural Policy, environment, sustainability, benefits.
JEL: O13, Q01, Q56

Introduction

Modern agriculture faces many opportunities and challenges. As a result of a number of environmental risks, such as erosion, compaction, salinization, pollution, loss of biological diversity, the quality of agricultural soils is increasingly deteriorating.

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In this regard, one of the possible solutions to overcome the negative consequences is the application of sustainable agricultural practices in agriculture. The new Common Agricultural Policy foresees a number of instruments and measures aimed at supporting the agricultural sector. The application of sustainable agricultural practices in agriculture leads to the mitigation of the impact of climate change, stabilizes agro-ecosystems and increases their resilience. Soil and water are one of the vital resources for carrying out agricultural production and for ensuring the stability and balance of ecosystems. The protection of the environment and natural resources are of priority importance for the production of healthy and safe food in order to improve living conditions in rural areas. These practices not only contribute to sustainable development, but also have a positive impact on food security, ecosystems and the well-being of local, regional and global populations.

The Common Agricultural Policy in the context of sustainable agriculture

The Common Agricultural Policy (CAP) was created in 1962 and is a set of laws and regulations, and its main tasks are related to providing affordable and safe food products for the population, maintaining a fair standard of living for farmers and preserving the natural environment and biodiversity. It is a tool to manage the transition to a sustainable food system and to strengthen the efforts of European farmers to contribute to the EU's climate and environmental goals. It is key to securing the future of agriculture as well as achieving the objectives of the European Green Deal. It seeks to secure a sustainable future for European farmers, provide more targeted support to smaller farms and enable greater flexibility for EU countries and their adaptation to changing conditions (https://agriculture.ec.europa. eu/sustainability/ environmental-sustainability/sustainable-agricultural-practices-and-methods_bg).

This report ***mainly aims*** to present some *good sustainable agricultural practices implemented by farmers in agriculture.* ***The main emphasis*** is placed on the Common Agricultural Policy in the context of sustainable agriculture, good examples of sustainable agricultural practices are presented and, on this basis, the main benefits of their application in agriculture are derived.

Farmers have the opportunity to apply green practices in modern agricultural holdings, which are environmentally friendly in order to preserve the properties of the soil, protect biological diversity and preserve nutrients in it. They can be supported with the help of direct payments, guaranteeing their income, promoting ecological agriculture with care for the protection of rural areas, the landscape and climate change mitigation impacts.

The CAP is built on three main objectives to achieve sustainability in agriculture:

- economic sustainability;
- environmental sustainability;
- social sustainability.

For their implementation, all EU countries use large-scale actions and measures, and each of them prepares a strategic plan for the CAP. Through them, countries provide support to increase farmers' incomes, support the transition to a sustainable model of agricultural production and contribute to achieving the objectives of the **EU Green Deal** (https://ec.europa.eu/commission/presscorner/detail/bg/ip_23_5986). In addition, the plans will contribute to mitigating the effects of climate change by implementing more active actions related to agricultural practices to capture carbon and its storage in soil, promote sustainable management of natural resources and protect and conserve soil ecosystems.

For the period 2023 – 2027, agriculture and rural areas are essential to deliver the Green Deal objectives and the CAP will be prioritized to achieve the ambitions of the Farm to Fork Strategy and the Biodiversity Strategy. The new CAP is aligned with Farm to Fork as the EU's flagship food strategy (Draft National Action Program to contribute to the implementation of the objectives of the "Farm to Fork" Strategy until 2030., 2023). The strategy aims to make the European food system a global standard for sustainability and focuses on reducing food waste and nutrient loss, promoting the transition to a sustainable food system and ensuring access to healthy foods.

From January 2023, the new CAP will be implemented with even more priority importance and with the contribution of agriculture to the protection of the environment and climate. **The new environment and climate schemes** – the so-called 'eco-schemes' – will be funded with 25% of each member country's direct payment allocation. Ecoschemes are a new tool in the CAP to support the transition to sustainable production, with each EU country specifying ecoschemes in their strategic plans to achieve the Green Deal targets. They support farmers in implementing environmentally friendly practices that have a minimal negative impact of agriculture on the environment and climate, thereby contributing to a shift to more sustainable agricultural farming models.

Agricultural practices to be supported by eco-schemes must meet the following conditions:

- cover activities related to climate, environment, animal welfare and antimicrobial resistance;
- to be determined on the basis of the priorities indicated at the national and regional level;
- their ambition must exceed the requirements and obligations according to the established preconditions;
- to contribute to the realization of the objectives of the EU Green Deal.

The set targets for achieving the EU Green Deal by 2030 are related to a 50% reduction in the overall use and risk of chemical pesticides and a 50% use of the more dangerous ones, at least 25% of agricultural land in the EU being occupied with organic farming and significantly increase organic aquaculture, reduce the sale of antimicrobials for

farm animals and in aquaculture by 50%, reduce nutrient losses by at least 50% and the use of fertilizers in the soil by at least 20%. The new CAP is defined by ten objectives related to the EU's general objectives for social, environmental and economic sustainability in agriculture (https://agriculture.ec.europa. eu/common-agricultural-policy/cap-overview/cap-2023-27/key-policy-objectives-cap-2023-27_en).
Figure 1 shows the specific objectives of the Common Agricultural Policy that relate to the implementation of sustainable agricultural practices in agriculture.

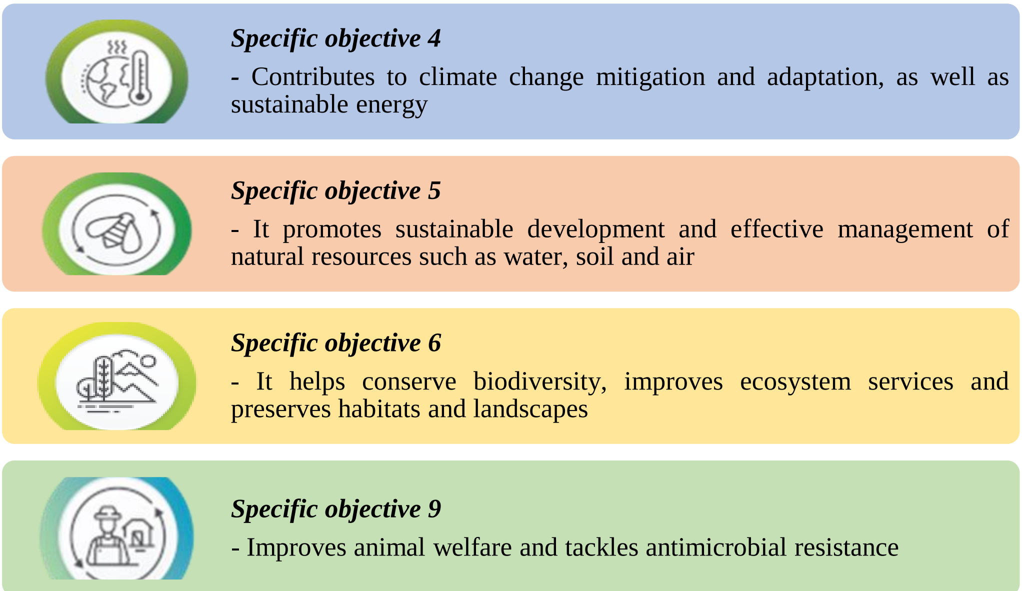

Figure 1. The specific objectives of the Common Agricultural Policy relating to sustainable agricultural practices

The listed objectives have a key role in promoting the implementation of sustainable agricultural practices in agriculture with priority importance for the economy in terms of mitigating climate change and reducing greenhouse gas emissions. Soil is one of the most important natural resources that supplies agricultural crops with the necessary nutrients. The practices applied contribute to ensuring high quality and safe food produced in a sustainable manner and at the same time improve animal health and welfare and address the fight against antimicrobial resistance. The transition to sustainable production systems offers new opportunities and challenges for agricultural holdings with the possibility of achieving sustainability in rural areas (Krasteva I. M., 2024)
According to Yordanova, “The impact of unsustainable agriculture on the environment and human health, there is a growing demand for sustainable agricultural products that can provide opportunities for farmers to switch to more sustainable practices.” (Yordanova, 2023)

In his research, Mitov examines basic indicators related to sustainable agricultural production and its impact on the environment, as key elements for the transformation of food systems into fair, healthy and nature-friendly ones. According to him, a concerted effort is needed to create a food production system that is based on sustainable agricultural practices to ensure healthy and quality food products (Mitov, 2023).

Agriculture will continue to develop, but on the basis of high environmental standards. Resource efficiency will continue to improve, high demands will be placed on environmental factors and agricultural sustainability processes will increase (Kirechev, 2020).

Good examples of sustainable farming

Nowadays, more and more farmers are realizing the importance of sustainable agriculture, looking for ways to reduce the negative impact on the natural environment and thus improve the sustainability of their farm. Sustainable farming practices can help farmers reduce their costs, increase their profits and at the same time preserve the environment and nature. Sustainable agriculture encompasses a variety of approaches and practices tailored to the region and the climatic characteristics of agricultural crops. A number of ***sustainable agricultural practices*** can be considered in the field of agriculture, which have a favorable attitude towards the environment and the climate (https://www.bivatec.com/ blog/sustainable-farming-practices-for-small-scale-farmers):

- ***Crop rotation*** is one of the main practices for sustainable agriculture. It represents an alternation of different cultures in time and place. If the same crop is grown in the same place for a long time, it will lead to soil wear. Therefore, it is necessary to grow different types of crops to improve soil fertility, reduce the impact of pests and plant diseases, and at the same time increase yields.
- A frequently used practice in agriculture is the sowing of ***cover crops or so-called catch crops.*** These are non-marketable plants grown between cash crops to preserve and improve soil fertility. They are used to reduce soil erosion, to suppress weeds and enemies. At the same time, they are a source of nutrients for the main crops and are one of the ways to retain water in the soil in order to preserve the soil structure, making it healthier and more productive.
- Another sustainable farming practice is the use of ***organic fertilizers***. They are obtained from natural sources such as animal manure, compost and plant material. They provide agricultural crops with the necessary nutrients, improve soil structure, increase water retention and reduce the risk of soil erosion.
- ***Integrated Pest Management*** (IPM) is another important practice for sustainable agriculture. IPM is a rational application of a combination of biological, chemical, physical, agrotechnical and selection measures against crop pests, where the use of chemical plant protection products is limited to a minimum. By

implementing integrated pest management, the risks of pesticide use on the environment and human health are reduced, stable agro-ecosystems are maintained and the biological diversity of farms is enriched.

- ***Conservation agriculture*** is one of the modern farming practices for cultivation, which aims to preserve the soil resource, also known as ***No till technology, zero tillage or no-till technology.*** It is an innovative approach to agro-ecosystem management to restore soil fertility while reducing soil losses and production costs (Krasteva, 2021). *Conservation agriculture* is a farming system that enhances natural biological processes, promotes the maintenance of permanent soil cover and contributes to the sustainable production of agricultural crops. At the same time, this type of practice avoids plowing the soil, thus leaving plant residues on the surface to protect the soil from erosion. As a result of the application of conservation agriculture, the structure of the soil is preserved, the balance of biological activity is improved, disturbances in the ecosystem are reduced, thus carbon is preserved in the soil and can be used by the next sown crop. This agricultural practice can be applied in regions that are prone to soil erosion.
- ***Precision agriculture*** – this is a complex system for optimizing agricultural production, using information data about agricultural crops. Different innovative technologies are applied, such as drones, satellite images or field mapping to improve the quality of the harvest. Precision agriculture minimizes the cost of materials and resources, such as water, seeds and fuel, reduces the dependence of agriculture on climatic conditions and provides the soil with the necessary nutrients.
- ***Biodynamic farming*** – this is a method of organic farming developed by Rudolf Steiner in the 1920s, involving holistic practices involving planting, cultivating and harvesting based on lunar and astrological cycles. He is considered a pioneer of the sustainable agriculture movement. Biodynamic farmers observe the cycles of the earth, sun, moon, stars and planets and try to understand their influence on the growth and development of plants and animals. There are biodynamic calendars that provide astronomical information for sowing and growing agricultural crops.
- Another good example of sustainable agricultural practice is the application of ***organic production*** methods by farmers. In organic farming, synthetic pesticides and chemical fertilizers are not used, but emphasis is placed on natural methods of plant protection with the aim of enriching the soil, preserving the biological balance in the farms and maintaining their biodiversity. This method generally promotes crop rotation, cover crops and biodiversity conservation. Organic certification ensures that products meet specific environmental standards and consumers are confident that they are buying sustainable, chemical-free food. Organic production is known for producing healthier and safer food while promoting environmental sustainability. ***Organic farming*** is an integrated system of agricultural management and food production, bringing together the best practices for the benefit of the environment, natural resources and maintaining high

standards of animal welfare. This sustainable innovative model of agriculture has the potential to become an economically efficient sector that stimulates the development of local businesses on a regional, national and European scale (Nikolova, 2021).

- It is possible for farmers to adopt and incorporate ***agroforestry*** as a sustainable agricultural practice in their operations. Agroforestry involves planting trees and other woody plants in agricultural landscapes. This approach effectively sequesters carbon in the soil, reduces food insecurity and is an additional source of income for farmers with the possibility of product diversification. Agroforestry is an environmentally friendly system that provides environmental, economic and social benefits to society. It can be used as an alternative way to maintain the balance of ecological systems, support agricultural production, increase agricultural productivity, support access to cleaner energy and contribute to mitigating the fight against climate change (Kirechev, 2024).
- ***Protection of water resources*** – water is essential not only for people, plants and animals, but also for the development of the economy. It is an irreplaceable and limited resource that must be used in a sustainable manner. However, it is subjected to a number of negative impacts from agriculture, tourism, industry and energy. In recent years, industrialization has led to the pollution of water bodies and disruption of the cycle of ecosystems. The preservation and protection of water resources is not only a regional or national problem, but affects the population at the global level. Therefore, in order to achieve a favorable state of water resources, the choice of the right crops is important. Those that are more adaptable to the climatic conditions of the region are chosen. It would be good to build irrigation systems in case rivers dry up or soil degradation occurs. Rainwater harvesting systems can also be implemented, and urban waste water can be used for irrigation after recycling.

Of course, in addition to the mentioned sustainable agricultural practices, there are other examples such as ***mulching, urban farming, carbon farming, ecosystem services*** and others that promote the sustainability of ecosystems, improve human well-being and eliminate pollution of the environment and nature.

Benefits of implementing sustainable agricultural practices

Traditional agricultural practices with the use of excessive amounts of chemical pesticides and fertilizers can very often be unsustainable, leading to a number of risks to human health and the environment, such as soil degradation, water pollution and a host of other environmental problems. Conventional agriculture is unsustainable to address challenges such as climate change, environmental pollution, food security, energy sources, and biodiversity loss (Anderson, Bruil, Chappell, Kiss, & Pimbert, 2021). This requires the attention of the farmers to be directed to the implementation of environmentally friendly practices sparing natural resources in order to achieve greater sustainability in the development of agricultural holdings in rural areas. A number of ***effects can be listed from the application of sustainable agricultural practices*** expressed in *environmental, economic and social benefits* (https://solarimpulse.com/sustainable-agriculture-solutions#):

- ✓ ***Sustainable farming practices can increase productivity and profitability*** – to improve soil structure, farmers can apply different methods, such as crop rotation, cover cropping or integrated pest management. This will reduce the need for expensive inputs, leading to increased crop yields, higher profits for farmers and a more sustainable agribusiness.
- ✓ ***Sustainable agriculture contributes to the protection of natural resources and the environment*** – conventional agricultural practices can lead to deterioration of soil fertility, soil erosion, water pollution and depletion of natural resources. By implementing sustainable practices such as water conservation and building sustainable irrigation systems, farmers can help preserve these resources for future generations.
- ✓ ***Sustainable practices can improve health and food safety*** – the application of chemical pesticides and fertilizers pollutes the soil and thereby the food products that the population consumes. Sustainable practices avoid the use of dangerous fertilizers and pesticides and use mainly natural methods to control pests and improve soil fertility, resulting in the production of safer and healthier food for the public.
- ✓ ***Sustainable agriculture can help farmers adapt to climate change*** – climate change challenges have a significant impact on agriculture, thereby threatening crop yields. Sustainable agricultural practices can help farmers adapt to climate change, improving their resilience.
- ✓ ***Sustainable farming practices can benefit local communities and the economy*** – sustainable farming practices can create jobs in the local community. Farmers applying sustainable agriculture can help improve livelihoods in rural areas and at the same time stimulate the development of the local economy on a regional and national scale.

In conclusion, we can summarize that the adoption and implementation of sustainable agricultural practices by farmers is essential for the future of agriculture. All environmentally friendly practices provide a range of diverse environmental, social and economic benefits necessary to minimize negative impacts on the environment. It is important to protect and conserve natural resources, which contribute to providing the population with healthy and safe food products. The new CAP lays the foundation for fairer and more sustainable agricultural farming models. Undoubtedly, the application of sustainable agricultural practices is one of the possibilities to achieve long-term sustainability of agriculture and contribute to stimulating the development of the rural economy on a regional, national and global scale.

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AGRICULTURAL DYNAMICS IN THE EU AND THE RAW MATERIAL SUPER CYCLE

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Abstract

Purpose:

This study aims to explore the impact of the Raw Material Supercycle (RMSC) on agricultural dynamics in the European Union (EU), focusing on key commodity crops such as wheat, maize, barley, sunflower, and the unorthodox but strategic choice of potatoes. The inclusion of potatoes is particularly relevant due to their dietary significance, adaptability to diverse growing conditions, and their potential as a substitute crop during periods of raw material volatility. The research investigates how global raw material trends influence crop production, export values, and market structures within the EU. Moreover, it seeks to identify key domestic and policy-driven factors that moderate the RMSC's effects on the agricultural sector.

Methodology:

Utilizing a multi-method research approach, the study combines regression models with comparative analysis and trend analysis. Regression models are applied to assess the influence of the RMSC on production volumes and export values of wheat, maize, barley, sunflower, and potatoes. The study contrasts the performance of these crops during different phases of the super cycle, identifying key dependencies and divergent trends across the EU. Furthermore, the study tracks changes in the areas under harvest, yields, and production levels for each crop, providing a nuanced understanding of agricultural dynamics in light of global raw material fluctuations.

Key Findings:

The study reveals significant correlation between the RMSC and the performance of EU commodity crops. For instance, while France and Italy continue to dominate the export market for wheat, Bulgaria has emerged as a rising producer, with strong potential for future dominance in this sector. The choice of potatoes, often overlooked in traditional studies, proved insightful, as their unique growing flexibility and substitutive value contributes to mitigating the impact of raw material price volatility. Moreover, the Common Agricultural Policy (CAP) plays important, but limited in effects role in moderating the global super cycle's effects by providing subsidies that buffer internal market dynamics.

Originality/Scientific Novelty:

This research provides an in-depth analysis of how global raw material cycles influence regional agricultural systems, specifically addressing the unorthodox yet strategic role of potatoes. By integrating crop-specific performance during different RMSC phases, it contributes a new understanding of localized agricultural vulnerabilities and resilience.

Practical Value/Implications:

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The findings offer valuable insights for policymakers, particularly in crafting agricultural strategies that can anticipate and mitigate the effects of future super cycle phases. Recommendations include targeted investments in crop diversity and substitutable crops, with implications for strengthening agricultural resilience across the EU.
Keywords: EU agriculture, Raw Material Super Cycle (RMSC), commodity crops, comparative analysis, regression models, policy impact, production yields, export value.
JEL: Q10, Q18, Q56

Introduction

This article explores the complex interplay between agricultural dynamics in the European Union (EU) and the raw material super cycle, with a specific focus on commodity crops. As the global economy experiences fluctuations driven by various factors, including geopolitics, understanding the implications for EU agriculture is essential. Through a comprehensive examination, this study investigates how the raw material super cycle influences the production, export value, and consumption of commodity crops within the EU.
The methodology employs a multi-faceted approach to unravel the intricate connections. Comparative analysis techniques will be utilized to contrast production levels, yields, and areas under harvest of key commodity crops across different phases of the raw material super cycle, enabling the identification of trends and dependencies. Regression models will quantitatively assess the relationships between movements in raw material production volumes. This approach facilitates precise measurement of impacts. Moreover, trend analysis methods will track agricultural indicators over time to pinpoint potential patterns and turning points influenced by the super cycle phases. Recognizing the importance of qualitative factors, the study incorporates conclusions from policy reviews, technological advancements, and other elements shaping EU agriculture. Case studies focusing on specific countries or regions may provide deeper insights into localized dynamics. To anticipate future developments, scenario modelling techniques will be employed, considering projections for raw material super cycles alongside other crucial factors.

Literature Review

The term Raw Material Supercycle (RMSC) refers to long-term trends in the value dynamics of commodities or raw materials that are essential to the production of goods and services. This cycle can last for several years or even decades and is driven by a combination of supply and demand factors (Dreher, A. et al., 2017).
The RMSC can be divided into several phases. During the early phase, there is a period of steady prices due to guaranteed supply from the global value chains, often caused by technological advancements that increase productivity or a period of weak global economic growth (Balié, J., et al., 2019). As demand increases or supply decreases, prices begin to rise, leading to the second phase of the cycle. The second phase of the RMSC is characterized by a period of high prices and volatility

in both supply and demand. This is often caused by a sudden surge in demand from emerging markets, geopolitical tensions, or supply disruptions. The third phase of the RMSC is marked by a period of declining prices as supply outstrips demand. This phase can be quite prolonged with prices falling to levels below the long-term average. During this phase, producers may cut back on investment in new capacity, which eventually leads to a tightening of supply and the start of a new cycle. The term Raw Material Supercycle (RMSC) for agricultural commodities refers to long-term trends in the value dynamics of essential crops and raw materials used in food production and related industries. (FAO, 2015).

In agriculture RMSC can also have apparent stages of development. Low value purchase options phase due to surplus supply. As the demand goes up or the supply decreases, it causes the beginning of the second phase of the cycle, which is marked by high market volatility and uncertainty in a variety of factors, (Lobell and Gourdji's, 2015). Similarly, as Headey, D., & Fan, S. (2018) state, these are usually triggered by a sudden upsurge in demand from emerging markets, geopolitical tensions, or supply disruptions. During this phase, farmers adjust production, leading to oversupply. The third phase is characterized by a prolonged period of contracting price levels as supply exceeds demand, frequently descending below the long-term average. In this phase, farmers may decrease production, ultimately resulting in a supply contraction, and triggering a new cycle.

Further observations define the early phase as a period of steady purchase value options due to mostly guaranteed supply, often caused by technological advancements that increase productivity (Belke, A., et al., 2019) or a period of weak global economic growth. As demand increases or supply decreases, purchase value begins to rise, leading to the second phase of the cycle. The second phase of the RMSC is characterized by a period of high market divarication in both supply and demand. The third phase of the RMSC is marked by a period of declining commodity value as supply outstrips demand.

In recent years, the agriculture RMSC has been relatively muted, with prices remaining stable or declining slightly. In this article, we put forward an additional argument, that currently the EU agriculture is indeed in a state of “false muting” of the RMSC. In the very few scientific reviews on the subject, there is no clear analysis of such operational environment, where farmers are subjected to a multitude of risks (Komarek, A. M., et al.). A “false muting” of the RMSC refers to situations where certain factors may temporarily suppress or mask the impact of the RMSC on certain commodities or regions. In support of our example, an ecosystem of aggressive economy as proven by Hrabynska, I., & Kosarchyn, M., (2022), can create temporary imbalances that could mute the effects of the RMSC.

In the case of the EU, while the entity is a significant producer of certain agricultural commodities, the impact of a Raw Material Supercycle on the agricultural sector

may be influenced by a variety of factors that are very specific. These factors include the union's Agricultural Commodities Market (ACM) infrastructure, geopolitical shakes, trading barriers, trade agreements with third countries, internal policies, and union affiliations among others.
There are several reasons to support the argument that EU's agriculture is currently in a Raw Material Supercycle. The ever-strong demand for agricultural commodities as the global supply chain disruptions, coupled to population growth, and the demand for food and other agricultural products is increasing. The supply of agricultural commodities is limited due to their character and supply chain bottle necks. Still being the main trade currency, as the Euro and US dollar weaken, it becomes cheaper for other countries to import commodities, including agricultural commodities. This can artificially increase demand, but temper supply as traditional supply is dependent on political discretion.
On another hand, we can further find evidence for a so called "false muting" of the Raw Material Supercycle in EU agriculture underlined by structural capacities in the sector. These limit the sector's ability to take advantage of higher prices. EU agriculture has not seen significant targeted investment beyond the green political spectrum, which has limited its ability to modernize and increase productivity as a complete sustainable package. Besides the longtime used subsidies, the Common Agricultural Policy (CAP) fails to address crucial needs on national level. This leads to a situation where prices remain high, but farmers are not able to take advantage of them. Climate change has been the single, more consistent political shout of the EU. It bears a significant impact on EU agriculture, with more frequent droughts and extreme weather events. According to Reardon, T., et al., (2019), this can lead to lower yields and increased production costs, which could offset the ability to scale produce or purchase in poorer and developing countries.
Overall, while there are factors supporting the argument that EU agriculture is experiencing a Raw Material Super Cycle, there are also significant challenges that could limit the sector's ability to benefit from it, therefore experiencing the muted state of the RMSC. The current agriculture RMSC for the EU began in the 90s and it is still ongoing. During this period, demand for commodities such as wheat, corn, and sunflower have increased due to strong emerging markets, especially in China and Africa. Moreover, supply disruptions in key producing regions made a major contribution to these trends. In recent years, the agriculture RMSC has been relatively muted, with actual value of raw materials remaining stable or declining slightly, however throughout our analysis becomes apparent that the low, or non-dynamic prices fail to show the underlying trends in export value formation due to cost of energy sources (Woetzel, J., et al., 2017), global inflation, EU particulars like subsidies and state support, all critical for the existence of union agriculture. In this article, we will put forward an additional argument, that EU agriculture, evident in the case of asset crops, is in a state of "false muting" of the RMSC. In the very

few scientific reviews on the broader subject, there is no clear analysis of such operational environment. A "false muting" of the RMSC could also refer to situations where certain factors may temporarily suppress or mask the impact of the RMSC on certain commodities or regions. In support of our example, factors such as sudden geopolitical tensions, financial liquidity injections, unplanned market release of excess stock-in-store levels of third countries, unintended goods acquisitions, or low demand due to institutional market interventions during economic downturns can create temporary imbalances that could mute the effects of the RMSC.

In essence, the EU is a capable producer and one of the biggest exporters of agricultural commodities in the world, which puts it in a prime position to participate in addressing ever increasing demands. Even within permanent state of market uncertainty and various other pressures, the RMSC presents a unique opportunity for the agricultural sector (Belke et al., 2018). Overall, this is confirmation that there is a decisive influence of global economic environment on the choice of a country's or even a group of countries model of socioeconomic development, (Tolstobrova, N. A., et al. 2015).

Commodity crop production represents a foundational pillar of agricultural activity within the EU, with crops such as wheat, corn, potatoes, sunflower and Barley occupying significant acreage and contributing substantially to both domestic food supply and international trade, (Mathieux, F., et al., 2017). According to Erten, B., & Ocampo, J. A. (2013), the raw material super cycle exerts a direct influence on production dynamics, in essence reflecting itself as a raw material-centric indicator, and even used both in criticality assessments and circular economy monitoring, (Tercero Espinoza, L. A. (2021), determining areas harvested, export value, investment decisions, and agricultural practices. Trade dynamics within the EU could be also compositely linked to the raw material super cycle due to somewhat sustainable intensification (Tilman, D., et al, 2011), with fluctuations in commodity production affecting the competitiveness of EU exports in global markets and influencing trade balances. Understanding how the super cycle influences trade flows, market access, and trade agreements is critical for policymakers seeking to foster robust international trade relationships and enhance the EU's position in global agricultural markets. Moreover, the raw material super cycle exerts a profound influence on commodity crop consumption patterns within the EU and outside of it, as fluctuations in production and availability directly impact consumer choices, food prices, and nutritional outcomes (Pingali, P., 2017). Understanding these dynamics is essential for policymakers and stakeholders involved in food security, public health, and agricultural policy formulation, as it enables them to anticipate and address potential challenges such as food price volatility, supply chain disruptions, and access to nutritious foods (von Braun, J., & Tadesse, G., 2012). Comprehending how the raw material super cycle impacts commodity crop production, trade, and consumption is integral to navigating the complexities of agricultural dynamics within the EU.

The study aims to address several gaps in the existing literature on the interplay between the raw material super cycle and agricultural dynamics in the EU. Apparent is a limited understanding of specific impacts on EU agriculture, including commodity crop production, export value, and areas harvested. Periods of high commodity demand within the RMSC lead to higher production levels, needed to meet market needs, but affecting buying power of large groups in society according to Ivanic, M., & Martin, W. (2016), which further affect the market. Farmers may adjust their planting decisions in response to market signals, leading to shifts in the mix of commodity crops grown in the EU. Ultimately, deriving from the research of Huygens, D., & Saveyn, H. G. M. (2018), as a response to higher demand, the investment in agricultural technologies and sustainable practices aimed at increasing crop yields and efficiency may be incentivized. In recent times a certain lack of comprehensive analysis that examines the interconnectedness between the raw material super cycle and various aspects of EU agriculture without fully capturing the holistic impact of the RMSC on the agricultural sector is more evident. That, coupled with limited empirical research that quantitatively assesses some of the mechanisms through which the RMSC influences agricultural dynamics in the EU brings incomplete understanding of policy implications, and leads to delayed, incomplete or improper reactions to economic signals. In reality, existing literature does not fully explore the policy implications of the RMSC on EU agriculture. In many cases this includes how government policies, trade agreements, regulatory frameworks and possible relationship with the financialization of the commodity markets (Montero Requena, J., 2021) interact with the RMSC dynamics to shape agricultural outcomes, deeming their actions reactive, rather than proactive. More is yet to be desired about unaccounted regional variations on social, cultural, and local macroeconomic level, as evidenced by Motianey, A. (2010). A deeper look into existing research shows us that it considers inadequately for regional variations within the EU, including differences in agricultural practices, climatic conditions, and socioeconomic factors. Presenting a detailed understanding how these particulars interact with the Raw Material Supercycle is essential for this comprehensive analysis. Further, current literature focuses on short-term impacts of the RMSC on EU agriculture, it overlooks the long-term dynamics and structural changes that may occur over extended periods of economic cycling. A better understanding of the long run is necessary for effective policy planning and decision-making.

Purpose (Aim): Using both quantitative analysis and qualitative insights, this article aims to highlight the presence of a RMSC in agricultural commodities, demonstrating its close alignment with the broader economic RMSC. By examining the Raw Material Supercycle in the context of commodity crop production in the EU from 1990 – 2022, the article reveals important mechanisms shaping agricultural dynamics and identifies opportunities and challenges for stakeholders across the agricultural value chain. The findings provide a deeper understanding of the complex relationship between the RMSC and EU agricultural trends, offering valuable insights for policymakers, farmers, traders, and consumers.

Methodology

The article examines the influence of economic and environmental factors on the production of barley, maize, potatoes, sunflower and wheat in four leading agricultural economies of the European Union – France, Germany, Italy and Spain, where we have added Bulgaria due to the fact that it is the fifth largest wheat and sunflower exporter in the union. The selection of these countries is due to their significant role in the EU's agricultural sector, while amongst major cereals like barley, maize, sunflower, and wheat, potatoes have been included because they represent a non-cereal crop with distinct dietary and production patterns, market demand, and climate sensitivity. Further, potatoes' exhibit distinct pricing and export behaviors, often divergent from those of cereals, making them an essential component when analyzing agricultural trends under the Raw Material Supercycle. This broader crop selection allows for a more comprehensive understanding of how different types of agricultural products behave under varying economic and environmental pressures. The data has been sourced from the Food and Agriculture Organization (FAO) in its entirety. The methodology used includes multiple linear regression analysis, where the dependent variable is the production volume in tons. The independent variables include export value, area harvested in hectares and yield as tons per hectare. Applying our methodology in analyzing the RMSC, we have selected a specific research time period of 33 years (1990 – 2022), which corresponds with different phases of the Raw Material Supercycle. For the purpose of this study, we provide a simplified parallel breakdown of potential time periods in the development of EU agriculture. The so called, **Expansion Phase** (1990 – 2008) saw robust economic growth and increasing demand for raw materials, including agricultural commodities, driven by globalization, industrialization, and rapid development in emerging EU economies. Key events during this phase include the establishment of the European Single Market in 1993, EU enlargement in 2004 and 2007, and the accession of several Central and Eastern European countries. Agricultural production in the EU expanded to meet growing domestic and international demand, supported by technological advancements, agricultural subsidies, and somewhat favorable uninterrupted market conditions. The **Peak Phase** (2008 – 2013), coincides with the global financial crisis of 2008 and its aftermath, characterized by economic downturns, market volatility, and reduced consumer spending. One of the factors greatly affected the development of the RMSC into its peak phase is the increased liquidity disbursement, particularly to institutional organizations. The 2008 financial crisis influenced the dynamics of the RMSC in various ways. While a direct impact of

liquidity injections on agricultural commodity prices may have been hidden or delayed, the indirect effects on market sentiment, speculative activity, investment strategies, and financial interconnectedness have significantly influenced the dynamics of the Raw Material Supercycle in the agricultural sector. These complex interactions are crucial for assessing the broader implications of liquidity-driven interventions on agricultural commodity markets and for informing risk management and investment decisions. During this period, agricultural markets experienced fluctuations in prices, trade volumes, and production levels as demand contracted and financial constraints for small and medium farmers affected investment and consumption. EU agricultural policies and subsidies underwent reforms influencing production incentives, market support mechanisms, and trade dynamics.
Following the peak phase, the **Contraction Phase** (2013 – 2016), reflected a period of economic stabilization and gradual recovery, although uncertainty and risk aversion persisted. Agricultural markets faced challenges related to subdued demand, price volatility, and changing consumer preferences, prompting adjustments in production strategies and market positioning. Policy responses from the EU included efforts to enhance market resilience, promote sustainable agriculture, and address environmental concerns through initiatives such as the CAP reforms. During the Contraction Phase (2013 – 2016) of the Raw Material Super Cycle, consumer price volatility remained a significant concern, influenced by various factors beyond commodity market prices. Factors beyond commodity market prices provide a more comprehensive understanding of the drivers for export value volatility during the Contraction Phase of the RMSC. These interconnected factors underscore the complex nature of consumer markets and highlight the various channels through which liquidity injections in financial markets can influence consumer demand dynamics during a RMSC. **The Recovery Phase** (2017 – 2023), presented a mixed picture for EU agriculture, marked by both opportunities and challenges amidst geopolitical turmoil, supply chain disruptions, and unforeseen crises. The COVID-19 pandemic compounded these challenges, disrupting labor availability, transportation networks, and consumer behavior. Lockdown measures and trade restrictions hindered agricultural operations and distribution channels, exacerbating existing vulnerabilities within the sector. As geopolitical tensions escalated, particularly with the special military operation in Ukraine and other global conflicts, EU agriculture faced heightened uncertainty and instability. These events not only affected trade relations and access to key markets but also raised concerns about food security and supply chain resilience. Massive agricultural strikes across the EU in 2023 highlighted growing discontent among farmers over issues such as income inequality, regulatory burdens, and market volatility. These protests underscored the socio-economic pressures facing agricultural communities and called into question the effectiveness of policy responses. Moreover, EU farmers grappled with intensifying price competition from third countries, where lower production costs and regulatory

standards provided unfair competitive advantage. This influx of cheaper agricultural products threatened the livelihoods of domestic farmers and challenged the EU's commitment to sustainable and ethical practices.
Amidst these challenges, efforts to promote agricultural innovation and sustainability continued, albeit with varying degrees of success. Diversification strategies, investment in value-added products, and quality standards remained priorities, but progress was hindered by resource constraints and shifting market dynamics. The so-called recovery phase is characterized by a fragile equilibrium, with EU agriculture navigating through a complex web of geopolitical, economic, and social factors. The sector's resilience and ability to adapt to these challenges will determine its long-term viability and sustainability in the face of an uncertain future. The complex agricultural landscape within the EU manifests through distinct cultivation patterns across member states, each specializing in key commodity crops. Despite all of their contrasting, they contribute significantly to the EU's agricultural output, each specializing in crops suited to their geographical and climatic conditions. These commodity crops form the backbone of the EU's agricultural sector, closely linked to the ongoing dynamics of the Raw Material Super Cycle.

Materials and Methods

The materials and methods section of this study involves a practical analysis of the current state of the RMSC in EU agriculture and the factors that can enable the sector to unlock its potential. To achieve our objectives, we conducted a literature review on existing studies of the agriculture sector, raw material super cycles, and many related topics. We also analyzed data from various sources. The data sets were made using descriptive statistics and econometric models to identify trends and patterns.
Our study employed a mixed-method approach, combining quantitative and value data sources to provide a broader understanding of the sector's potential in the context of a Raw Material Supercycle.

Results and discussion

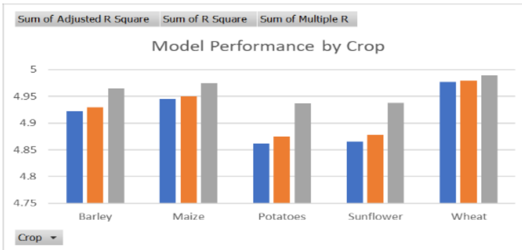
The regression analysis provides strong evidence for the factors driving agricultural production within the context of the Raw Material Super Cycle as seen in Table 1. The underlined role of export value in Table 3 and indispensable factors of area harvested, and yield per hectare in Table 1, highlight how demand, agricultural practices, and land use interact to influence production levels. Such understanding helps confirm the RMSC theory, demonstrating that production dynamics are closely tied to cyclical patterns in raw material markets.

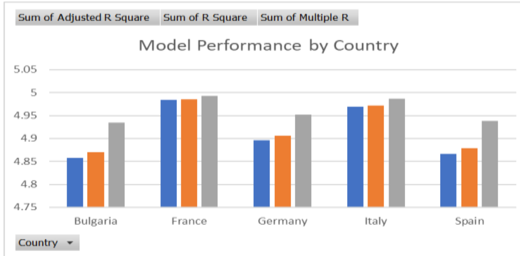
Table 1. Results from Comparative Analysis of Agricultural Commodities in EU Countries

Crop	**Country**	Multiple R	R Square	Adjusted R Square	Standard Error	Observations	**Intercept**	**Export Value**	**Area harvested (ha)**	**Yield t/ha**
Barley	Bulgaria	0.98015	0.96069	0.95663	57623.55035	33	-793912.60065	0.73450	3.68571	190541.37685
Barley	France	0.99818	0.99636	0.99599	86652.34676	33	-10394971.71081	0.03170	5.90158	1755269.75834
Barley	Germany	0.99310	0.98625	0.98482	157851.31771	33	-10255392.76627	-0.20919	5.74169	1786753.99260
Barley	Italy	0.99920	0.99839	0.99823	10411.30087	33	-1117985.94615	0.46168	3.80210	292262.78461
Barley	Spain	0.99397	0.98798	0.98674	107910.12929	33	-6011377.11515	-0.04942	2.84539	2104958.69306
Maize	Bulgaria	0.99194	0.98395	0.98229	113337.09292	33	-2000138.83563	0.31267	4.44924	436083.66736
Maize	France	0.99839	0.99678	0.99645	111488.75721	33	-14129933.56024	0.04535	8.67856	1618278.82863
Maize	Germany	0.99746	0.99493	0.99441	72352.99209	33	-3138832.31151	0.89765	7.23619	418846.67582
Maize	Italy	0.99577	0.99155	0.99068	165375.93557	33	-7906043.24412	2.20337	9.54498	810390.27018
Maize	Spain	0.99166	0.98339	0.98168	103949.46385	33	-3316680.29443	-2.07552	8.76741	390126.36789
Potatoes	Bulgaria	0.96726	0.93560	0.92894	42953.34032	33	-321138.85750	-6.73617	12.47346	23153.98760
Potatoes	France	0.99938	0.99875	0.99862	37973.29431	33	-6913684.33178	-0.08452	41.27934	168288.09241
Potatoes	Germany	0.97677	0.95409	0.94934	262718.70897	33	-6330173.04968	-1.85789	26.00486	264856.41763
Potatoes	Italy	0.99920	0.99839	0.99823	10411.30087	33	-1283605.31027	-0.10565	22.56511	56829.42652
Potatoes	Spain	0.99397	0.98798	0.98674	107910.12929	33	-526618.16803	-3.51615	17.47840	63271.68120
Sunflower	Bulgaria	0.99639	0.99279	0.99205	55759.31555	33	-960583.61352	0.14289	1.55082	643467.48320
Sunflower	France	0.99710	0.99420	0.99360	26982.55472	33	-1578197.31093	-0.00607	2.23171	704503.80804
Sunflower	Germany	0.98594	0.97208	0.96919	10132.18058	33	-80029.45457	-0.04611	1.82151	42356.42583
Sunflower	Italy	0.99791	0.99582	0.99539	6819.41200	33	-302627.43608	-0.10164	2.15740	140259.41157
Sunflower	Spain	0.96099	0.92351	0.91559	65479.72759	33	-747869.82807	-0.89609	0.78497	943018.19647
Wheat	Bulgaria	0.99881	0.99763	0.99738	68048.59817	33	-3188611.93799	0.20705	2.92166	1092411.89066
Wheat	France	0.99967	0.99935	0.99928	97373.55925	33	-35039819.10616	0.00486	6.56254	5331721.55758
Wheat	Germany	0.99910	0.99821	0.99802	148432.89355	33	-20282640.86980	0.09785	6.94040	2917992.94154
Wheat	Italy	0.99406	0.98815	0.98692	90652.06734	33	-8015425.63588	0.13669	3.62520	2185710.94918
Wheat	Spain	0.99785	0.99571	0.99526	91700.26051	33	-6011377.11515	-0.04942	2.84539	2104958.69306

The proving concept for a RMSC, characterized in our case, by prolonged periods of rising demand drivers for key commodities, has garnered significant attention. In this analysis, we focus on five crucial raw materials – barley, maize (corn), potatoes, sunflower, and wheat – across five European countries: Bulgaria, France, Germany, Italy, and Spain. Through a combined analysis of regression statistics for each crop and country, we uncovered trends, anomalies, and implications pointing to obvious similarity with the broader raw material market and very much indicative of such a super cycle. Analyzing barley as a key raw material, France and Germany exhibit a significant positive relationship between area harvested and yield, contributing to high production levels. France showcases exceptionally high Adjusted R Square values, indicating a strong correlation between the predictors and the dependent variable. This could suggest robust predictive models or potentially influential factors not captured by the other countries' analyses. Italy's regression shows a significant positive coefficient for yield but a negligible impact of export value, indicating potential domestic-focused production. However, Italy shows the highest Multiple R, indicating a strong linear relationship between the other variables and yield. An anomaly arises in Spain, where the export value has a negative coefficient, suggesting a unique market dynamic possibly influenced by domestic demand or trade policies. Generally, all countries exhibit high R Square values, implying that the chosen variables explain a significant portion of the variability in barley yields.

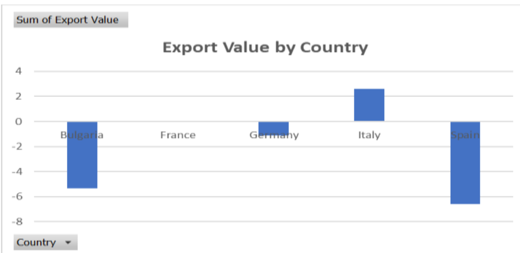
Table 2. Model Performance by crop and country

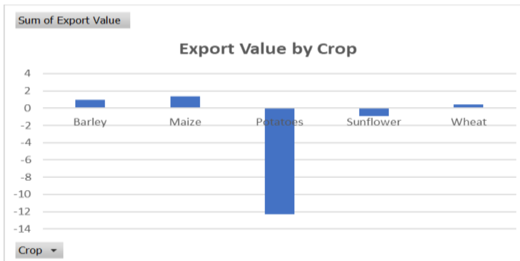




Across all countries variables for Maize area harvested and yield have strong positive effects on production (Table 3). Italy demonstrates remarkably low Standard Error compared to other countries, suggesting relatively precise predictions. Another anomaly in Italy's regression is the significant negative coefficient for export value, indicating a potential domestic demand focus. Bulgaria exhibits high Multiple R and R Square, indicating a strong linear relationship between other variables and maize yield. France and Germany also display strong relationships, while Spain shows slightly lower coefficients but still significant relationships.

Table 3. Export Value variances by crop and country





With potatoes, the area harvested significantly impacts production in all countries, with Germany and Bulgaria showing particularly strong coefficients. Spain exhibits a negative coefficient for export value, suggesting a domestic market emphasis. France displays extremely high R Square values, suggesting a tight fit between predictors and yield. Nevertheless, across all countries, the models explain a substantial portion of yield variability, as indicated by high R Square values. Italy shows exceptionally low Standard Error, indicating consistent precise predictions.
Considering the importance of sunflower, the area harvested has a significant positive impact on production across all countries. An anomaly in Italy's regression analysis is the insignificant coefficient for export value, contrasting with other countries this is probably due to the fact that the sunflower is shadowed by substitute export products more common for Italy and unfit for our analysis. Spain

demonstrates notably low R Square and Adjusted R Square values compared to other countries, suggesting the only weaker relationship between predictors and yield in the set. Bulgaria, France, and Germany showcase strong relationships between predictors and yield, as evidenced by high R Square values. Italy exhibits the lowest Standard Error, indicating another consistency with precise predictions.
When we look at wheat, across all countries the area harvested and yield strongly influence production, with Bulgaria showing the highest coefficients. France exhibits its extraordinarily high R Square and Adjusted R Square values, indicating a robust fit between predictors and yield. Further, an anomaly in France's regression is the insignificant coefficient for export value, suggesting a potential focus on domestic consumption. Italy displays the highest Multiple R, suggesting a strong linear relationship between predictors and wheat yield. All countries demonstrate high Adjusted R Square values, indicating that the models provide a good fit for the data. In addition, the positive and significant relationship between export value and production suggests that higher global demand and prices (characteristics of an upward phase in the RMSC) drive increased production. Investments in technology and land expansion could be typical responses to sustained higher demands, both locally and internationally, further validating the cyclical pattern of increased production following market booms.
Our findings highlight the importance of domestic factors, such as agricultural policies and internal market dynamics, in shaping production trends for the key crops. Anomalies in export value coefficients suggest varying degrees of reliance on domestic markets versus international trade, which can also be attributed to certain guarantied sales, but structured response to external market demand. This is there on supported by strong positive relationships between area harvested, yield, and production, that are indicative of the potential for increased output to meet rising global demand. Our concise analysis, supported by the above statistical regressions and evidencing the presence of anomalies underscores the need for far more nuanced approach and tailored strategies in navigating the current RMSC.
The combined analysis by regression statistics for five key crops across five European countries reveals both consistent trends and notable anomalies. This analysis accentuates the existence of a RMSC, particularly evident across the different crops and countries. The observed anomalies, such as the lower predictability of sunflower in Spain and the inverse relationship of potatoes in Bulgaria, offer insights into localized market dynamics and areas for further investigation. Overall, the high predictability and strong correlations in most cases affirm the cyclical nature of raw material production, value and export, contributing to the broader understanding of global agricultural trends. While the overall picture suggests a positive outlook for meeting global demand amid a Raw Material Supercycle, the nuances of each country's production dynamics support the importance of tailored strategies and policy

interventions to optimize agricultural productivity and resilience in a currently, and in the years to come very fluid market environment.

The development of a proactive strategy for EU agriculture amidst raw material super cycles necessitates an approach that addresses structural vulnerabilities while capitalizing on emerging opportunities. By implementing a comprehensive set of measures encompassing efficiency, diversification, risk management, sustainability, market access, capacity building, financial resilience, and policy adaptability, the agricultural sector can navigate the challenges posed by Raw Material Supercycles with resilience and adaptability.

Conclusion

This study highlights the importance of understanding agricultural dynamics across different crop types – cereals and non-cereals – during the Raw Material Supercycle. By analyzing the behavior of barley, maize, potatoes, sunflower, and wheat, it captures the diversity of agricultural responses to both market and environmental pressures, offering a comprehensive look at EU agricultural trends under varying phases of the RMSC. There are several avenues for future research and further exploration of the topic of the Raw Material Supercycle and its implications for EU agriculture:

1. *Investigating the historical patterns and long-term trends*: By analyzing historical data and identifying recurring cycles, researchers can gain insights into the drivers and mechanisms underlying the RMSC and its implications for agricultural production, trade, and consumption in the EU.
2. *The effectiveness of existing policy responses and adaptation strategies in mitigating the impacts of the RMSC on EU agriculture*: Iteratively evaluating the role of agricultural policies, trade agreements, financial instruments, and support programs is helping farmers and agribusinesses navigate cyclical fluctuations and economic uncertainties.
3. *The role of technological innovation and sustainable agricultural practices*: Exploring the adoption of precision farming technologies, agroecological approaches, digitalization tools, and climate-smart practices as means to improve productivity, resource efficiency, and environmental sustainability in the face of RMSC.

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THE EVOLUTION OF ASSOCIATIVE FORMS IN AGRICULTURE/FRUIT GROWING CULTURE IN ROMANIA

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Abstract

In Romania, there is a significant diversity of forms of association that operate in various fields, both based on the activities carried out and on the specifics of the economic branches, at county, regional and national level. This diversity includes, but is not limited to, producer associations, producer groups, cooperatives, branch unions, etc. Over time, the activity of these associative entities has been subject to a legislative framework that has evolved to respond to the specific needs and challenges faced by these organizations. The present study aims to provide a detailed analysis of the evolution of the forms of association in Romania, focusing on identifying the essential similarities and differences between cooperatives and producer groups. This analysis will include an in-depth examination of the organizational structure of cooperatives and producer groups, based on the latest available data on this sector of the economy. In assessing the current state of fruit farms in Romania, a detailed analysis of data from 2005 – 2020 was carried out, considered the most recent source of information at farm level. This assessment was carried out using an approach that considered the legal form of the farms, their physical and economic size, and the development regions in which they are located. Thus, the study will not only bring to the fore relevant information about the fruit sector, but will also contribute to a deeper understanding of the dynamics and diversity of the forms of association in Romania, providing a solid basis for future research and development in this field. In addition, the analysis will also include aspects related to the impact of climate change on production, as well as consumption trends influencing the fruit market. These elements are essential to outline an overview of the challenges faced by farmers and to identify opportunities for growth and adaptation in the face of global change. We will also examine the role of agricultural policies and subsidies in supporting the sector, highlighting how they can stimulate innovation and sustainability, but also the vocational training of farmers, which has contributed to increasing the number of plantations, the

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quality of products and their diversification. The importance of European grants thus becomes obvious, as they have not only stimulated the increase in the number of fruit farms, but have also contributed to the development of a more competitive and innovative agricultural economy in Romania.
Keywords: Rural Development, sustainability, association in agriculture, fruit-growing farms.
JEL: Q13, Q19

1. Introduction

In Romania, there are numerous forms of associations, both in terms of activities and specific sectors, at the county, regional, and national levels. From producers' associations to producers' groups, cooperatives, branch unions, etc., the activity of these forms of associations has been regulated over time, and existing legislation has been adapted to respond to the evolution of these associative forms.
The role of associative forms in the overall development of agriculture is undeniable. These associative forms can better capitalize on the socio-economic development opportunities of the agricultural sector by using the collective strength of their members to implement support measures adapted to the local level. When the main objectives cannot be achieved individually, association can represent the only way to achieve these objectives, taking the agricultural exploitation to the next level, that of producing for the market, not just for self-consumption.
Beyond the advantages offered by belonging to an associative form, in Romania, it is necessary to overcome certain barriers that hinder the development of associative forms. These barriers are related to the existence, within cooperatives, of members with their own behavioral traits, who have a certain level of education and professional training and who are reluctant to give up their individual beliefs in order to think collectively and in the interest of all members. Additionally, Romania's recent history, when after 1945 people lost their land and means of production as a result of the collectivization process initiated by the Communist Party, leads to a certain reluctance among agricultural producers to associate.
Beyond these functional and social barriers, association and cooperation are modern forms of organizing means of production and commercialization, which can bring Romanian agriculture to the same level as European agriculture, and can help agricultural producers meet the competitive demands of the market. Members of an associative form must have common goals and attitudes oriented towards tolerance, entrepreneurial spirit, generosity, the desire to learn as much as possible, and to be open to technology and the implementation of new, modern techniques for obtaining agricultural products.
Association is extremely important in all fields, but especially in those in decline. One such sector is the fruit-growing sector, where the measures and agricultural policies that have been implemented over time have not resolved the problems faced by this sector.

2. The Stage of Knowing the Problem

Association is a concept that has been studied over time by researchers both at the international level and in the national context. There are numerous studies that have examined the impact of association on rural businesses and the extent to which association contributes to the development of rural businesses. The contribution of well-constructed agricultural policies to stimulate certain sectors was studied in the work “Fruits and Vegetables are Essential for the Wealth of Agriculture” by author Ganry, J. (2012). According to him, the role of governments, through a series of commitments, should be one of the key components of the virtuous circle linking fruit and vegetable production to nutrition and better health. In the author's opinion, authorities need to encourage private initiatives in the production, packaging, processing, and marketing of fruits and vegetables as part of public-private partnerships. It is important for many countries to adopt such a stance and to consider fruit and vegetable production as central to the wealth of agriculture.

The unique characteristics that cooperatives acquire over time can lead to the application of different techniques and methods for achieving performance. In the work “Performance of Small Agricultural Cooperatives: What is in the Mind of Management,” authors Ishak, S., Omar, A. R. C. and collaborators analyzed, through individual interviews, the managerial behaviors of the cooperative leaders included in the study. According to the study, the performance of small cooperatives can be defined as the ability to conduct basic management tasks in an effective and efficient manner, in line with the expectations of its members. The study offers new perspectives derived from a practical standpoint, considering the nature of the cooperatives presented in the study.

The existence of strong cooperatives can lead to the mitigation of phenomena related to poverty and lack of employment in rural areas. In the work “Cooperatives and the Alternative Food Network in Italy: The Long Road to a Social Economy in Agriculture,” authors Fronte, M., Cucco, I. (2017) studied the phenomenon of cooperatives in Italy specialized in the agricultural sector. The study's results reflect a paradigm shift for cooperatives, moving from working exclusively for the benefit of their members to identifying better ways to support the communities where they operate. The study's conclusions show that the vast majority of cooperatives that have demonstrated economic efficiency must also demonstrate their social aspect, implementing a cooperation model closely linked to the community, thinking, and implementing initiatives oriented towards solidarity.

At the national level, association and associative forms have been extensively studied. Author Apetroie, C. (2008), in the work “Current Practical Approaches in the Association of Agricultural Producers,” studied the extent to which the forms of association found in Iași County have developed and their stage of development. According to the study, as of 2008, most agricultural producers in Iași County were

considering belonging to an associative form. Additionally, the study indicated that authorities play an important role in stimulating association at the national level.
The role of cooperatives in the development of agriculture in Romania was studied by authors Gherman, R., Iancu, T., Dincu, A. M. and Brad, I. (2016), in the work titled "Professional Associations and Agricultural Cooperatives in Romania and the EU – Key Factors in Agricultural Development." The study's results showed that the establishment of associative forms opens up more economic development opportunities by attracting local/regional advantages, using collective power to enhance the prosperity of members and the communities they belong to. The practice of association for better representation in front of authorities has been present in Romanian agriculture since 1990.

3. Research methodology

In order to establish the methodology for this study case, classic tools of observation and examination were used. Procedures based on factual analyses were employed, along with intensive research in the existing literature within this new field. The methodology of the study involves direct tools such as gathering information from specialized literature and from current practices in public institutions in our country, namely MADR (Ministry of Agriculture and Rural Development), AFIR (Rural Investment Financing Agency), as well as information from major platforms such as Eurostat, FAO, Agridata, INS (National Institute of Statistics), TEMPONLINE.

4. Analysis and results

4.1 Analysis of the situation of fruit-growing farms in Romania

Regarding the distribution of fruit-growing farms across Romania's 8 development regions, it can be observed that as of the year 2020, the majority of farms were located in the South-Muntenia region, where 34,040 fruit-growing farms were recorded. This represents a 91.1% increase compared to the number of farms in this region in 2005 (17,720 fruit-growing farms). For this region, during the analyzed period, an average of 25,182 fruit-growing farms was determined, with a positive growth rate of 13.9% and a coefficient of variation of 28.48%, indicating a relatively heterogeneous degree of analyzed data (Table 1)."
Comparatively analyzing the data recorded in 2005 with those from 2020, the most significant increase in the number of fruit-growing farms is observed in the development regions: North-East (312.1%) and West (205.8%). Conversely, the region where the number of fruit-growing farms decreased in 2020 compared to 2005 is Bucharest-Ilfov, where there was a decrease of 68.9% in the number of fruit-growing farms (Table 1).

Table 1. Examination of the number of fruit farms categorized by development region, during the period 2005 – 2020

Specification	2005	2007	2010	2013	2016	2020	2020/ 2005	Medie	Ritm (%)	C.V. (%)
Total	39.770	37.420	63.500	63.540	66.920	85.580	115,2	59455,0	16,6	30,50
Northwest	7.930	9.530	14.470	13.200	16.510	22.040	177,9	13946,7	22,7	36,37
Center	2.200	1.700	2.290	2.300	2.520	3.590	63,2	2433,3	10,3	25,83
NORTH EAST	1.570	2.460	4.010	3.220	3.570	6.470	312,1	3550,0	32,7	47,06
South East	1.370	1.640	3.350	2.870	2.500	4.120	200,7	2641,7	24,6	39,27
South – Muntenia	17.720	15.320	27.030	29.010	27.970	34.040	92,1	25181,7	13,9	28,48
Bucharest – Ilfov	1.320	370	330	360	260	410	-68,9	508,3	–20,9	78,84
South-West Oltenia	6.110	4.510	9.240	9.320	8.970	10.180	66,6	8055,0	10,7	27,60
West	1.550	1.880	2.780	3.260	4.630	4.740	205,8	3140,0	25,1	42,82

Source: Eurostat data processing, accessed 12.04.2024

One development region where the fruit-growing sector is very well represented is the North-West region, where in 2020 there were 22,040 fruit-growing farms, which is 177.9% more than those recorded in 2005 (7,930 fruit-growing farms). For this region, during the analyzed period, an average of 19,947 fruit-growing farms was determined, with a positive growth rate of 22.7% and a coefficient of variation of 36.37%, indicating a relatively heterogeneous degree of analyzed data (Table 1).

4.2 Evolution of fruit-growing farms, classified by physical size

The number of fruit-growing farms has shown a significant upward trend, with the exception of the year 2007. As of the year 2020, Romania recorded a total of 85,580 fruit-growing farms, an increase of 115.2% compared to 2005, when there was a total of 39,770 fruit-growing farms. During the analyzed period, an average value of 50,977.9 fruit-growing farms was determined, with a positive growth rate of 16.6% and a coefficient of variation of 35.57%, indicating a relatively heterogeneous degree of analyzed data (Table 2)."

Regarding the physical size of fruit-growing farms, the most numerous were farms with a physical size of less than 2 hectares. In 2020, there were 66,730 such fruit-growing farms, which is 124.5% more than those existing in 2005 (29,720 fruit-growing farms). For the analyzed interval, an average value of fruit-growing farms smaller than 2 hectares was determined to be 38,484 fruit-growing farms, with a positive growth rate of 17.6% and a coefficient of variation of 41.53%, indicating a heterogeneous degree of analyzed data (Table 2).

Table 2. Examination of the number of fruit farms, classified by physical size, during the period 2005 – 2020

Specification	2005	2007	2010	2013	2016	2020	2020/ 2005	Medie	Ritm (%)	C.V. (%)
Total	39.770	37.420	63.500	63.540	66.920	85.580	115,2	50977,9	16,6	35,57
< 2 ha	29.720	22.860	49.220	48.650	52.080	66.730	124,5	38483,5	17,6	41,53
2 – 4,9 ha	6.900	9.600	10.330	10.660	11.580	14.460	109,6	9091,4	15,9	27,22
5 – 9,9 ha	2.080	2.850	2.720	3.060	2.680	3.030	45,7	2352,2	7,8	15,19
10-19,9 ha	640	1.600	720	830	450	810	26,6	725,2	4,8	54,64
20-29,9 ha	150	160	140	100	80	210	40,0	125,7	7,0	36,63
30 – 49,9 ha	100	190	150	80	40	160	60,0	111,4	9,9	50,45
50 – 99,9 ha	80	80	80	70	20	110	37,5	68,2	6,6	43,16
> 100 ha	100	90	150	90	70	70	–30,0	77,1	–6,9	38,24

Source: Eurostat data processing, accessed 12.04.2024

In the year 2020, Romania had 14,460 fruit-growing farms with a physical size ranging from 2 hectares to 4.9 hectares, which is 109.6% more than the values recorded in 2005 (6,900 fruit-growing farms). During the analyzed period, an average value of fruit-growing farms with a physical size ranging from 2 hectares to 4.9 hectares was determined to be 9,091, with a positive growth rate of 15.9% and a coefficient of variation of 27.22%, indicating a relatively homogeneous degree of analyzed data (Table 2).
The number of fruit-growing farms experiencing the most significant decrease are those with a physical size greater than 100 hectares. If in 2005 there were 100 fruit-growing farms with an area larger than 100 hectares, by 2020 this number had decreased by 30% to 70 farms. For the analyzed interval, an average value of fruit-growing farms larger than 100 hectares was determined to be 77 fruit-growing farms, with a negative growth rate of 6.9% and a coefficient of variation of 38.2%, indicating a heterogeneous degree of analyzed data (Table 2).

4.3 Evolution of fruit-growing farms, classified by economic size

At the national level in Romania, in 2020, there were no fruit-growing farms that reported zero income from their activities (S.O. of 0 euros) (Table 3).
Nationwide, in 2020, there were 56,110 fruit-growing farms with an S.O. (economic size indicator) lower than 2,000 euros. The majority of such farms are located in the South-Muntenia development region (23,450 fruit-growing farms with an economic

size lower than 2,000 euros). In 2020, compared to 2005, the number of fruit-growing farms in the South-Muntenia region with an economic size lower than 2,000 euros increased by 73.7%. The average for the analyzed period was 17,745 farms, with a positive growth rate of 11.7% and a coefficient of variation of 28.1%, indicating a heterogeneous degree of analyzed data (Table 3).

Table 3. Examination of the number of fruit farms with an economic size below 2,000 euros, according to the development region, in the period 2005 – 2020

Specification	2005	2007	2010	2013	2016	2020	2020/ 2005	Medie	Ritm (%)	C.V. (%)
Total	29.490	21.960	48.960	42.110	42.310	56.110	90,3	40156,7	13,7	31,21
Northwest	5.460	5.550	11.280	8.580	9.280	13.720	151,3	8978,3	20,2	27,95
Center	1.670	1.130	1.730	1.740	1.820	2.390	43,1	1746,7	7,4	15,91
NORTH EAST	1.160	1.320	3.120	2.140	2.380	4.600	296,6	2453,3	31,7	32,76
South East	880	550	2.470	1.910	1.700	2.890	228,4	1733,3	26,8	45,02
South – Muntenia	13.500	9.420	21.310	19.980	18.810	23.450	73,7	17745,0	11,7	28,13
Bucharest – Ilfov	1.300	280	320	350	250	380	-70,8	480,0	-21,8	93,51
South-West Oltenia	4.720	3.010	7.200	6.130	5.360	6.510	37,9	5488,3	6,6	28,64
West	800	700	1.540	1.280	2.710	2.190	173,8	1536,7	22,3	52,47

Source: Eurostat data processing, accessed 12.04.2024

A significant percentage of the total fruit-growing farms with an economic size indicator (S.O.) lower than 2,000 euros are also found in the North-West development region (13,720 farms in 2020). Compared to 2005, the number of these farms increased by 151.3%, resulting in an average of 8,978 farms for the analyzed period, with a positive growth rate of 20.2% and a coefficient of variation of 28%, indicating a relatively heterogeneous degree of analyzed data (Table 3).
Similarly, in the North-East development region, the number of fruit-growing farms with an economic size indicator lower than 2,000 euros showed significant growth in 2020 compared to the data recorded in 2005. In 2020, there were 4,600 such fruit-growing farms, which is 296.6% more than in 2005. For the analyzed period, an average of 2,453 farms was determined, with a positive growth rate of 31.7% and a coefficient of variation of 32.8%, indicating a heterogeneous degree of analyzed data (Table 3).
A smaller percentage of the total fruit-growing farms with an economic size indicator lower than 2,000 euros are located in the South-East development region

(1,700 farms in 2020). Compared to 2005, the number of these farms increased by 228.4%, resulting in an average of 1,733 farms for the analyzed period, with a positive growth rate of 26.8% and a coefficient of variation of 45%, indicating a heterogeneous degree of analyzed data (Table 3).

5. The evolution of the forms of association in agriculture in Romania

The diversity of connections between the agricultural sector and other branches of the national economy, as well as the internal relationships within agriculture (such as those between producers and entities involved in storage, processing, and sales of products), influences the types of partnerships and collaborations that form.

5.1 The Situation of Agricultural Cooperatives in Romania

Analyzing the trend of the number of cooperatives at the national level in Romania, it shows an upward trend, reaching its peak during the analyzed period in 2018, when 280 cooperatives were established. However, in 2020, only 112 cooperatives were established, marking a decrease of 48.6% compared to the previous year, when 218 cooperatives were registered (Figure 1).

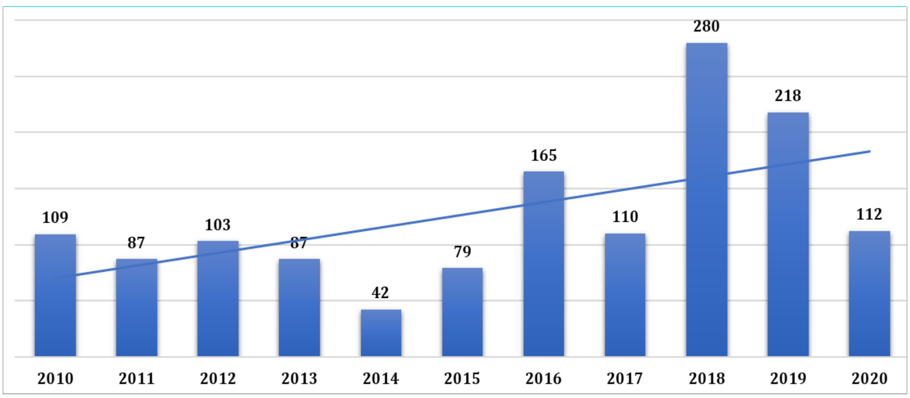

Figure 1. The evolution of the number of agricultural cooperatives established in Romania, in the period 2010 – 2020

Source: ONRC processing, accessed 16.04.2024

This increase in the establishment of cooperatives starting from 2016 can be attributed to the tax incentives introduced with the adoption of Law No. 164/2016, as well as the initiation of accessing and implementing measures for establishing cooperatives through the Local Action Groups (GALs) (Figure 1).

Out of a total of 1,696 cooperatives registered as of the year 2020, 88% of these are still operational, while 12% are no longer functional (Figure 2).

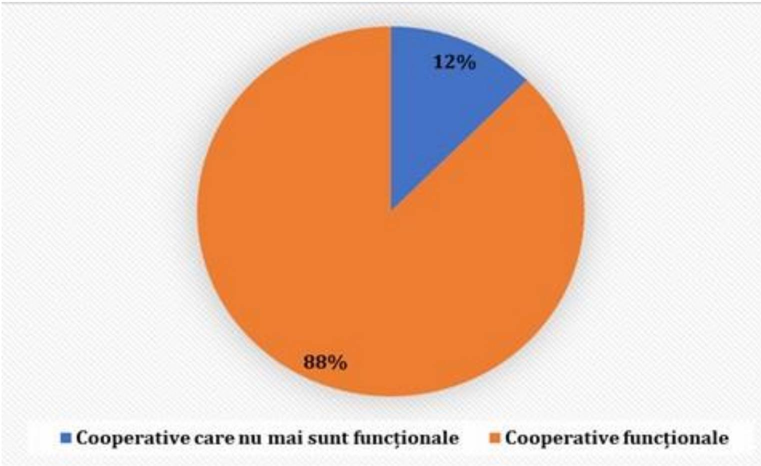

Figure 2. Percentage distribution of agricultural cooperatives according to functionality, in Romania, at the level of 2020

Source: ONRC processing, accessed 16.04.2024

Out of the total of 1,485 operational cooperatives as of the year 2020, 37% are classified as Grade I (solely individuals), while 63% are classified as Grade II (both individuals and legal entities) (Figure 3).

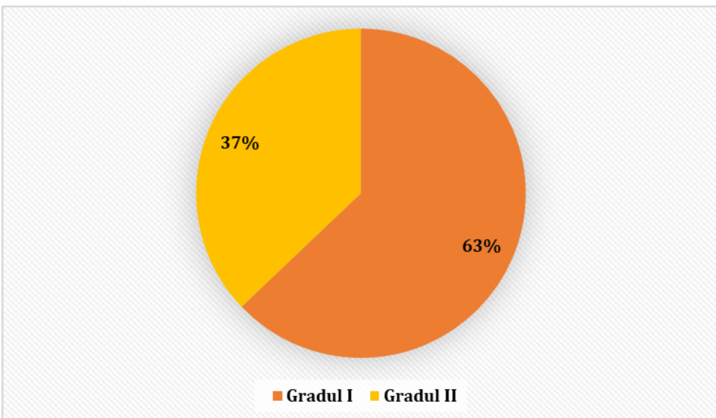

Figure 3. Percentage distribution of agricultural cooperatives according to their type, in Romania, at the level of 2020

Source: ONRC processing, accessed 16.04.2024

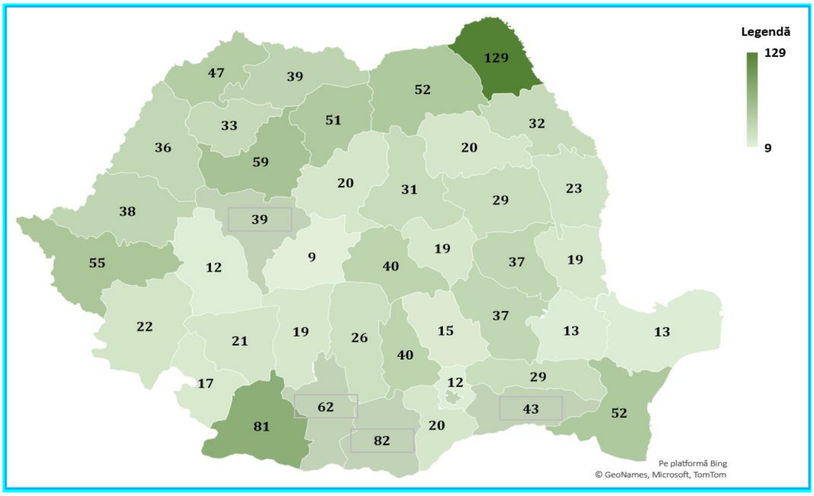

Figure 4. Distribution of agricultural cooperatives by county, at the level of 2020

Source: ONRC processing, accessed 16.04.2024

Analyzing the situation of functional agricultural cooperatives at the level of the year 2020, classified by county, we can state that the majority of agricultural cooperatives are located in Botoșani County with 129 entities, followed by Teleorman and Dolj counties with 82 and 81 agricultural cooperatives, respectively. On the other hand, at the opposite end are Sibiu County with 9 entities, and Ilfov and Hunedoara counties each with 12 agricultural cooperatives (Figure 4).

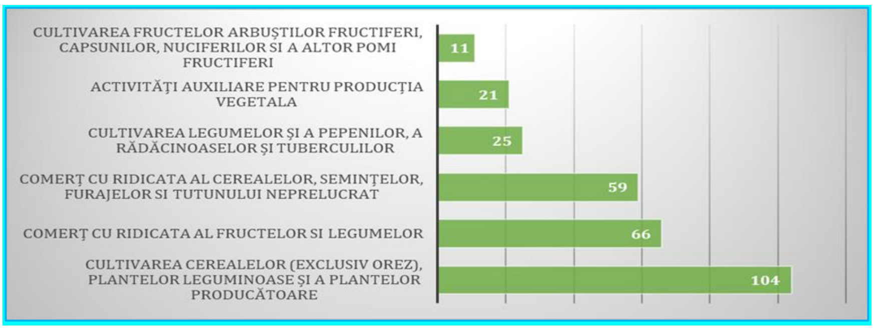

Figure 5. Classification of cooperatives operating in the plant sector, according to the CANE code, which submitted a balance sheet in 2019

Source: ONRC processing, accessed 16.04.2024

Out of the total number of agricultural cooperatives specializing in plant production that filed their financial statements in 2019, 104 of them were classified under the NACE code 'Growing of cereals (except rice), leguminous crops and oil seeds', while 66 cooperatives were specialized in wholesale trade of fruits and vegetables. Additionally, only 11 cooperatives were specialized in fruit cultivation.

5.2 The Situation of Producer Groups in Romania

Out of a total of 247 producer groups existing as of April 1, 2024, in Romania, the majority were located in Bihor and Suceava counties with 23 and 19 producer groups, respectively (Figure 6).

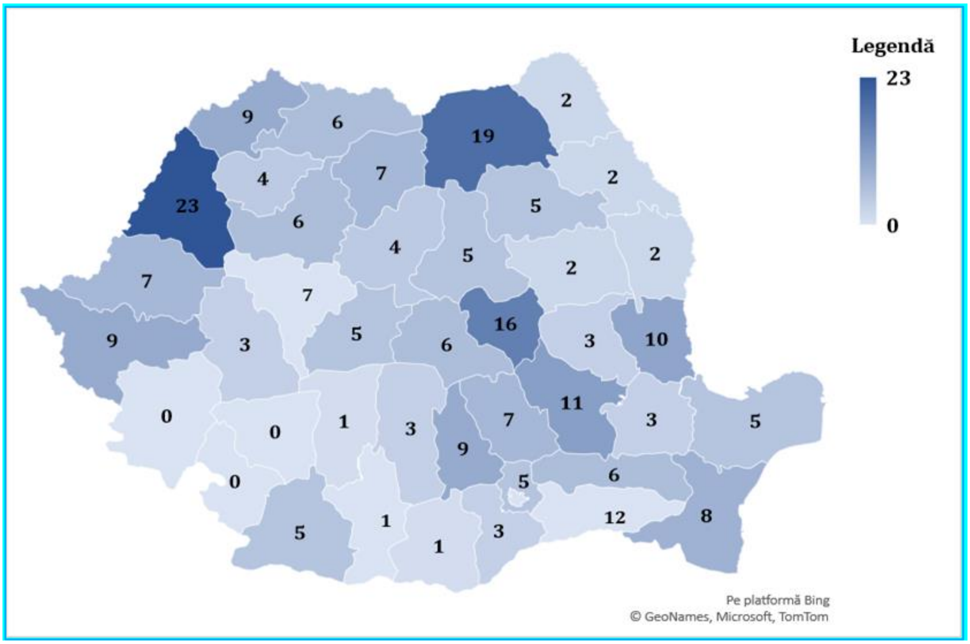

Figure 6. Distribution at country level of the total number of agricultural producers, registered in Romania

Source: MADR data processing regarding the number of available manufacturers until 01.04.2024

Also, a significant number of producer groups are also registered in Covasna and Călărași counties with 16 and 12 producer groups, respectively. At the opposite pole, there are counties such as: Caraș Severin, Gorj and Mehedinți that do not have any group of agricultural producers (Figure 6).

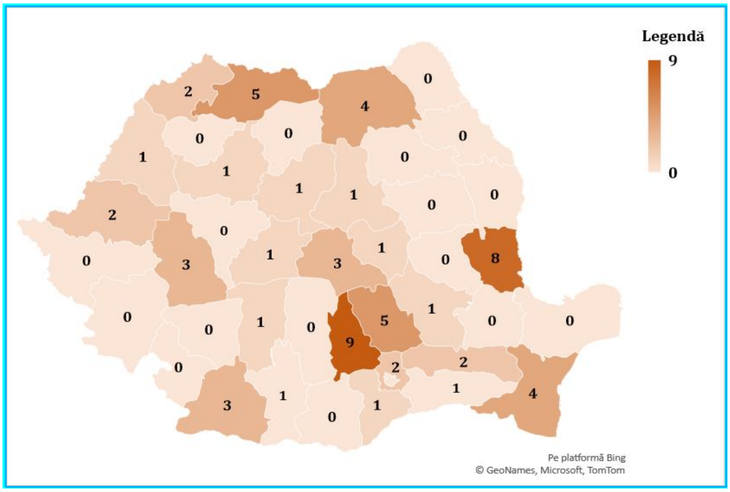

Figure 7. The county-level distribution of agricultural producers in the fruits and vegetables sector registered in Romania.

Source: MADR data processing regarding the number of available manufacturers until 01.04.2024

In terms of county-level distribution, regarding agricultural producer groups active in the fruits and vegetables sector, the highest number of producer groups were recorded in Dâmbovița County (known for its favorable conditions for fruit tree cultivation) and Galați County (recognized for its vegetable production basins at the county level), with 9 and 8 agricultural producer groups, respectively (Figure 7).

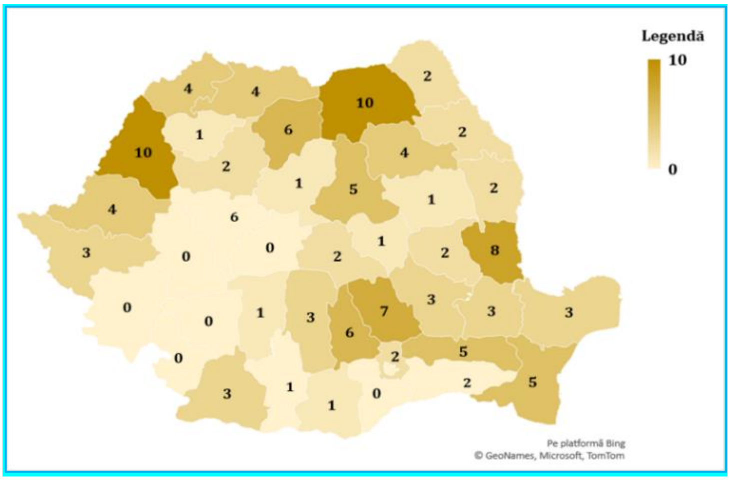

Figure 8. The county-level distribution of the number of agricultural producers who have retired, registered in Romania

Source: MADR data processing regarding the number of available manufacturers until 01.04.2024

Compliance with EU standards in environmental, climate, and food safety matters; Those who have been able to benefit from this support include producer groups (in the pomology sector) classified as SMEs and recognized (after January 1, 2014).
Regarding the non-repayable support granted to eligible applicants, it is up to 100%, but it cannot exceed 10% of the value of the sold production and 100,000 euros per year. This is provided in the form of a degressive lump-sum aid, in annual installments that cannot exceed 5 years from the date the group was recognized.

Table 4. Principles and selection criteria for applicants for sub-measure 9.1.a

Nr.	Principles and Selection Criteria	Score
1	Principle of cooperation	Max. 10 p.
	Scoring varies	4 – 10 p.
2	Principle of group representativeness (number of members)	Max 30 p.
	Scoring varies	20 – 30 p.
3	Principle of product quality	Max 35 p.
	Scoring varies	5 – 35 p.
4	Principle of association of small-scale farms	Max 20 p.
	Scoring varies	15 – 25 p.

Source: data processing Applicant Guide related to submeasure 9.1a, accessed 01.04.2024 – Rural Investment Financing Agency

Through this measure, producer groups that apply and are part of a partnership aimed at establishing an operational group have been encouraged. Additionally, producer groups with a higher number of members (over 15 members – 30 points) and targeting certified activities in organic agriculture (20 points) or certified activities under a quality scheme (up to 15 points) have also been encouraged.
According to the data found on AFIR (Agency for Financing Rural Investment), there were two open sessions for this measure targeting producer groups in the pomology sector. For the first session, a budget of 5.3 million euros was allocated, and for the second session, a budget of 1.99 million euros was allocated.
During the first session, a budget of 5.3 million euros was allocated, out of which the public value of the 3 winning projects was 1.22 million euros. Among these projects, 2 out of 3 cooperatives have between 6 and 9 members. All three cooperatives plan to invest in an organic certification system, and they all include farms with an economic size ranging from 50,000 to 100,000 euros.

Figure 9. Criteria met by applicants declared winners in the first open session, under sub-measure 9.1a

Source: AFIR data processing, accessed 04.04.2024

The 3 cooperatives declared winners are located in Dâmbovița, Bucharest and Suceava counties.

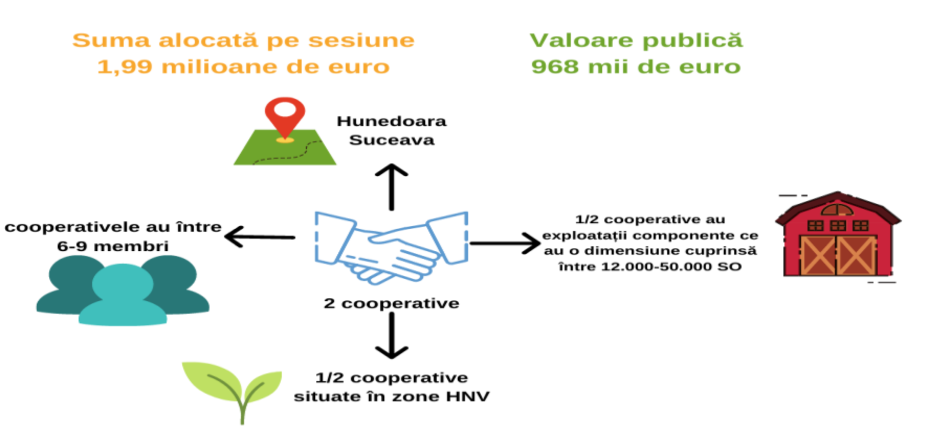

Figure 10. Criteria met by applicants declared winners in the second open session under sub-measure 9.1a

Source: AFIR data processing, accessed 04.04.2024

The second open session, targeting producer groups in the pomology sector, had a budget allocation of 1.99 million euros, out of which the public value of the winning projects was 968 thousand euros.

The winning cooperatives had between 6 and 9 members and were located in Hunedoara and Suceava counties.

6. Conclusion

Regarding the distribution of fruit-growing farms across Romania, broken down by the country's 8 development regions, it is notable that as of 2020, the majority were located in the South-Muntenia region, with 34,040 fruit-growing farms recorded. This figure represents a 91.1% increase compared to the number in this region in 2005, which was 17,720 fruit-growing farms.

Nationally, the number of legally recognized fruit-growing farms in 2020 was 1,290, which is three times higher than the number recorded in 2005. The highest numbers of legally recognized fruit-growing farms in 2020 were found in the development regions of North-West (300 farms), South-Muntenia (240 farms), and North-East (180 farms). In contrast, the Bucharest-Ilfov region had no legally recognized fruit-growing farms, while the South-East region had 110 such farms. The same number of legally recognized fruit-growing farms was also recorded in the South-West Oltenia region.

In Romania, the number of fruit-growing farms has shown a significant increase over the analyzed period, with the exception of 2007. By the year 2020, there were a total of 85,580 fruit-growing farms in the country, marking a 115.2% increase compared to 2005, when there were 39,770 such farms in total.

The average number of fruit-growing farms during this period was approximately 50,977.9, with a positive growth rate of 16.6%. The coefficient of variation stood at 35.57%, indicating a relatively heterogeneous distribution of the analyzed data.

At the national level in 2020, there were 56,110 fruit-growing farms with an economic size of less than 2,000 euros. The majority of such farms were located in the South-Muntenia development region (23,450 fruit-growing farms with an economic size of less than 2,000 euros). Compared to 2005, the number of fruit-growing farms in the South-Muntenia region with an economic size of less than 2,000 euros increased by 73.7% in 2020. The average for the analyzed period was 17,745 farms, showing a positive growth rate of 11.7% and a coefficient of variation of 28.1%, indicating heterogeneous data distribution. This category continues to represent the highest proportion of total fruit-growing farms.

From a total of 247 producer groups existing as of April 1, 2024, in Romania, the majority were located in Bihor and Suceava counties with 23 and 19 producer groups, respectively. Regarding the distribution at the county level of agricultural producer groups active in the fruit and vegetable sector, the highest numbers were recorded in Dâmbovița (known for its opportunities in fruit tree cultivation) and Galați (recognized for vegetable basins at the county level) with 9 and 8 agricultural producer groups, respectively.

It is noteworthy that Measure 9.1a did not attract significant interest from agricultural producers in the fruit-growing sector, as evidenced by the low number of applicants in the two project submission sessions. Farmers continue to be reluctant to associate themselves in producer groups or cooperatives, highlighting the need to identify new approaches to persuade Romanian farmers to collaborate.

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FAMILY FARMS – A SUSTAINABLE MODEL FOR THE DEVELOPMENT OF RURAL AREAS

DANIELA TSVYATKOVA[1]

Abstract
The family farm is a unique organizational form that holds significant economic and social importance in rural areas. These farms preserve traditions, customs, history, and authentic folklore and are symbolic of Bulgarian heritage in rural regions. They provide employment for rural households, enhance production efficiency, ensure food security, and contribute to the preservation of biodiversity. The purpose of this study is to analyze the advantages and disadvantages of family farms in promoting sustainable rural development. Motivation for agricultural and non-agricultural activities in rural areas is influenced by various factors, including natural and labor resources, financial support through the CAP (Common Agricultural Policy) and state assistance, market conditions, infrastructure, and more. To achieve the research goal, both quantitative and qualitative methods are employed, using representative data and results from comprehensive agricultural censuses, empirical sociological studies, desk research, and internet sources.
The involvement of the younger generation in farm ownership and the continued development of small businesses is essential for rural areas, serving as the backbone for economic activity and social structure. Targeted development of family farms will also contribute to the sustainable environmental growth of agriculture in Bulgaria and ensure greater attention to environmental preservation. Additionally, increasing the competitiveness of family farms can, beyond raising employment levels, lead to various secondary effects in rural areas, such as the development of related industries, income growth, risk reduction in agricultural activities, and workforce skill enhancement through experience and knowledge acquisition, as well as the implementation of innovations in production.
Family farms possess all the qualities needed to strengthen the economic vitality of rural Bulgaria and to be a significant factor in alleviating rural poverty, both by creating jobs and as consumers of various services provided by other rural residents.
Key words: family farms, rural regions, vitality, sustainable development
JEL: J15, J24, F51

Introduction

In the coming decades, rural areas will become attractive places to live due to various natural, ecological, and social reasons. These areas offer favorable conditions for developing numerous socio-economic activities based on natural potential, providing an alternative to conventional resources. Rural areas allow for the development of activities beyond traditional agriculture and forestry, such as non-agricultural activities that contribute to GDP and create jobs for the working and childbearing population. Young farmers describe the challenges of rural life as involving a particular lifestyle, low incomes, living in remote areas, lack of essential

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services, and social isolation. The family farm is a unique organizational form, as it simultaneously serves as a workplace, a territory, and a means of providing food and sustenance for the farming household, encompassing lifestyle, tradition, and more. Choosing to be a farmer is not only a professional decision but a choice of a specific way of life.

In recent years, numerous studies have focused on the entry of the new generation into farm management, bringing different perspectives, education, attitudes, and motivation, which ultimately benefit the introduction of innovations in farms (Van der Ploeg, 2018; Milone and Ventura, 2019; Pitson et al., 2020; Conway et al., 2021). This aligns with new trends and fulfills the specific goal of supporting young farmers and new entrants, promoting the sustainable development of rural economic activities. Historically, small farms have been the first and most resilient representatives of family and small businesses worldwide. The United Nations Food and Agriculture Organization (FAO) defines a family farm as "an agricultural holding that is managed and operated by a household and where agricultural labor is largely provided by that household." Family farms encompass a wide range of agricultural holdings: from small, semi-market farms with only family workers and those reliant on other profitable activities to diversify income, to large farms that are nevertheless primarily managed by family members. In other words, a family farm is managed by a household where most of the labor force primarily comes from that household. According to Barry (1975), Barnes & Hershon (1976), this is a business controlled by members of a single family.

Methodology

The objectives of this study are to analyze the advantages and disadvantages of family farms for enhancing sustainable rural development. The motivation for developing agricultural and non-agricultural activities in rural areas is influenced by a range of factors, such as natural and labor resources, financial support from the Common Agricultural Policy (CAP) and state assistance, market conditions, infrastructure, and others. To achieve the research objectives, quantitative and qualitative methods are employed, along with representative data and results from the 2020 agricultural census, findings from empirical sociological studies, a survey conducted with 845 agricultural producers across the country by the Ministry of Agriculture, desk research, internet sources, and case studies with young agricultural producers.

The involvement of the younger generation in the ownership of agricultural holdings and the continuation of small business development is of vital importance for rural areas, serving as the primary foundation for developing economic activity and the social structure.

Discussion and analysis of the issues

According to Eurostat, the number of farms in the EU-27 decreased from around 15 million to 10 million (–32%) between 2003 and 2016, with the largest decline occurring among small farms (<5 ha; –38%) and a moderate decline among medium-sized farms (5 – 19 ha and 20 – 49 ha, with decreases of 17% and 12%, respectively). Meanwhile, the number of large farms (>50 ha) increased by 7%. By 2040, the EU could lose an additional 6.4 million farms, leaving approximately 3.9 million farms remaining, an impressive 62% decrease compared to 2016.

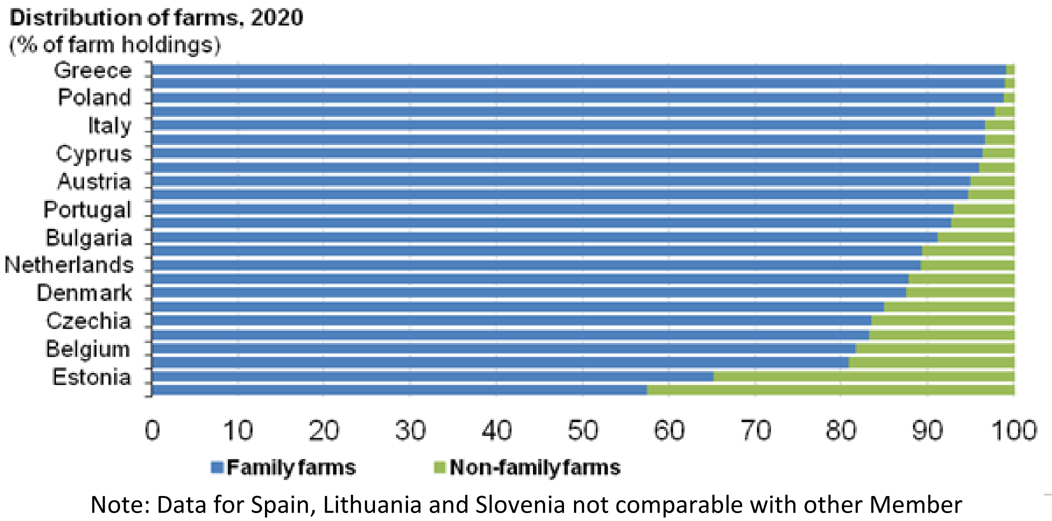

Figure 1. Number of family farms in Europe

Source: Eurostat

Family farms account for just over 9 out of 10 of the 9.1 million farms in the EU in 2020.

Statistical data from the latest agricultural census in Bulgaria clearly indicate a general decline in the number of young agricultural producers and a trend toward abandoning agricultural activities, despite the fact that rural areas offer new opportunities that young people living there could leverage.

Several authors (Glover, J., Reay, T., 2013) highlight business diversification and family obligations as motivating factors for heirs to continue the family tradition. The family farm is perceived both sentimentally as a means of preserving family values and as an inherited property (business). This arrangement can be understood as a unique type of “agreement between parents and heirs”, typically “oral and informal.” The strong connection of young generational farmers to their birthplace, agricultural land, and family traditions provides a reliable motivation for keeping young people engaged in agriculture. The targeted development of family farms will also contribute to the sustainable environmental development of agriculture in Bulgaria and enhance environmental preservation. Furthermore, by increasing the competitiveness of family farms, numerous secondary effects in the country's rural areas can be achieved, such as the development of related industries, income growth, reduced agricultural risks, workforce skill enhancement through experience and knowledge acquisition, and the introduction of production innovations.

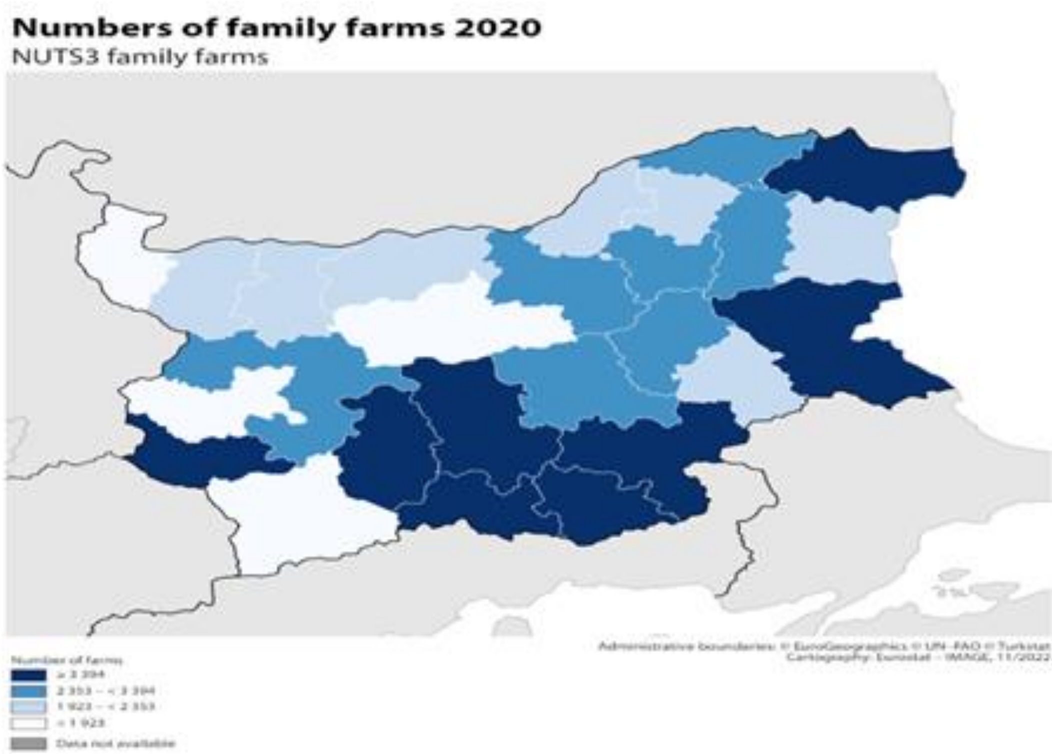

Figure 2. Number of family farms in Bulgaria 2020

Source: Eurostat

Family farms are primarily engaged in so-called labor-intensive sectors-livestock, vegetable production, and permanent crops-sectors which are crucial for Bulgaria for economic, social, and environmental reasons. Small farms play a key role in preserving local and traditional productions.

A study conducted as part of a research project[1] and by the Ministry of Agriculture, surveying 845 agricultural holdings in Bulgaria, examined the age structure of farm owners. The results show that the largest group of farm owners is those aged 50 or younger.

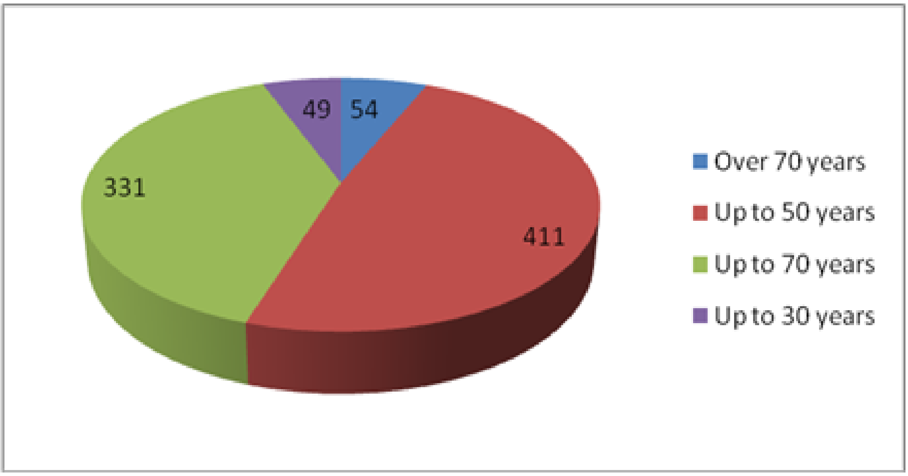

Figure 3. Age structure of farmers in Bulgaria

Source: Own calculations/survey of 845 agricultural producers

Over 60% of these farmers indicate that they have a successor who will manage the farm after them. It is a nurturing response that ensures the succession process has begun and is planned for the long term.

[1] Research within the framework of the project "Land Relations and European Policy: Synergy and Prospects for Bulgarian Agriculture (POZESIN)", implemented with the financial support of the Scientific Research Fund at the Ministry of Education and Culture, contract KP06-H35/from 18.12.2019

Figure 4. Do you have an heir to the farm?
Source: Own calculations/survey of 845 agricultural producers

Returning to a local approach in how we produce, process, and distribute food can help reshape our economy to address the challenges of climate change, biodiversity loss, and rising levels of social and economic inequality. This type of consumer demand cannot be met by industrial agriculture, which is unable to provide small batches of diverse products, but can be fully satisfied by small local farms. For this reason, consumers see these farms as gathering places for families, neighbors, and friends, environments where inspiring connections can be established and where they can feel closer to their roots. The underdeveloped market environment is a limiting factor for increasing the number of newly established agricultural farms, both nationally and regionally. Among the factors contributing to the current state of the market environment for small farm product sales in our country are: Decreased purchasing power of the population and the limited domestic market; Low investments in the food processing industry; Extreme fragmentation and dispersion of land plots, which discourages owners from even renting them out;

The very slow process of farm consolidation and land restructuring, resulting in most farms operating to meet the needs of their own members, with only a small portion producing primarily for the domestic market; A sharp reduction in areas cultivated with modern agricultural machinery; the widespread neglect of essential agricultural practices due to a lack of working capital; Significant reduction of irrigated land and minimal use of mineral fertilizers; Dependence on clients and suppliers; The unfavorable economic situation, which adds further stress; Income instability.

A survey among young people engaged in family farm activities highlighted the following main motivating factors:

- Satisfaction (37% of respondents)
- Fast business development in their home region, where they have strong familiarity (22%)
- Applying knowledge acquired in university (15%)
- High income potential (11%)
- Opportunities to access Rural Development Program (RDP) measures (9%)
- Family traditions (4%)
- Success of similar businesses in EU countries (2%)

The use of land and natural resource potential by new generations in different regions is a fundamental prerequisite and foundation for developing a form of multifunctional agriculture. This approach will enrich the rural economy, diversify production, and preserve the cultural identity of rural areas. The future Common Agricultural Policy (CAP) and other rural development policies should focus on enhancing the attractiveness of rural areas. This requires providing employment opportunities, decent working conditions, and high-quality services in fields like education, housing, culture, employment, social support, and more.

For the greater part of them, the land is a source of income as well as a family value. The next generation's awareness of turning land into a major factor of production has its long-term goal. Being heirs to a farm, proximity to home, relatives and the farm plays a key role. This supports the thesis about the social role of family business in rural areas.

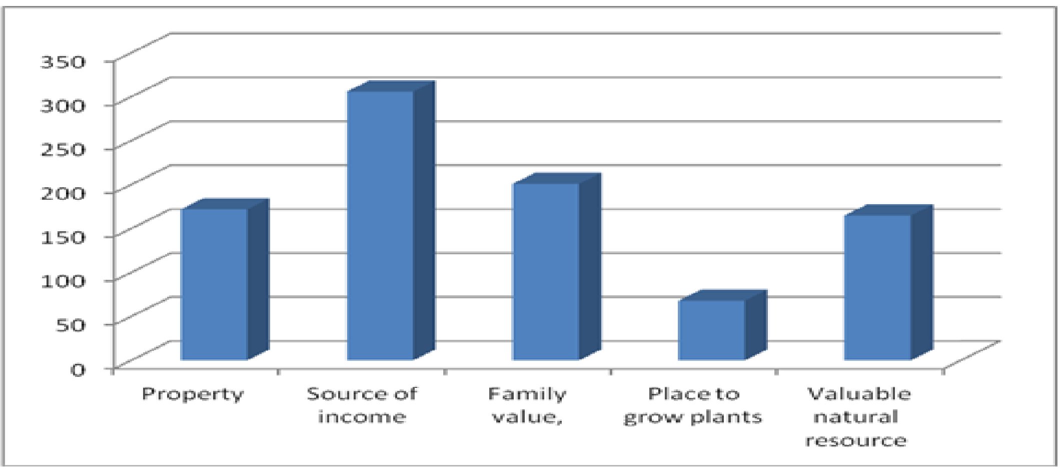

Figure 5. What is the earth for you?

Source: Own calculations/survey of 845 agricultural producers

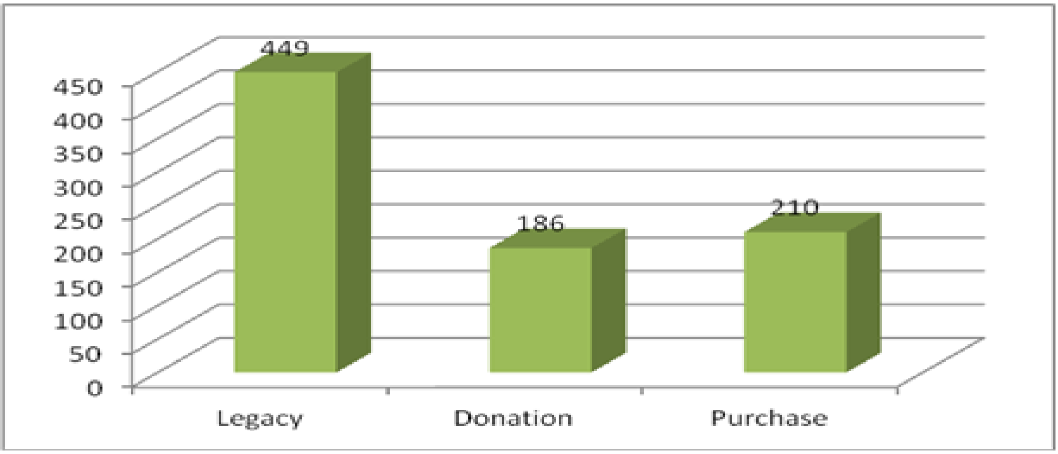

Figure 6. How did you get this land?

Source: Own calculations/survey of 845 agricultural producers

It is here that the role of farmers is key, as none other than they are the people who ensure the food security of the entire EU. And without young people, any sector has no future. That is why the CAP 2023-2027 bets extremely much on them.

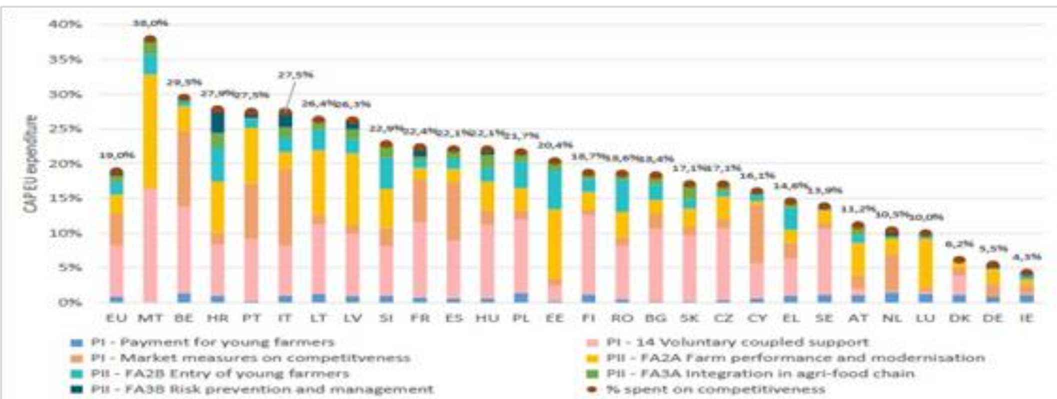

Figure 7. Guidelines for the development of farms in Europe (CAP 2030)

Source: Eurostat

However, there are trends that have proven stable over time. The conducted research is further strengthened by field and desk studies that elaborate on observations, suggesting that farms operating in rural areas can be categorized into several types of groups:

The ***first group – The home is in the village***. There is a strong attachment to agriculture and the land, especially for generational family farms. Traditions are well-preserved, with a transfer of experience, a drive to grow from a personal farm into a small or medium-sized operation. It is unacceptable for them to leave their land uncultivated or miss the opportunity to produce something that could help their children and families live better.

The ***second group – Farms of those employed in the tourism sector, offering guesthouses in rural areas and entirely business-oriented***. These entrepreneurs either settle in ancestral rural homes or prefer to purchase property in a rural area that meets specific requirements. In these farms, the yard is divided: one part is designated for agricultural activities, such as fruit, vegetable, and livestock production. This farmyard provides guests with the chance to experience agricultural production firsthand through demonstrations, observation, and even direct participation in work processes.

The ***third group – Driven primarily by a desire for a lifestyle change, seeking a quieter life, away from urban noise, overcrowding, and polluted air.*** They are motivated to manage a small farm for personal needs, often aimed at producing food resources that are "clean," grown naturally without artificial fertilizers. For this group, the right model is to develop family and ecological farming. They use their produce primarily for personal consumption, with a small portion sold at local markets or online through specialized sites.

The ***fourth group – Based on social exclusion and economic necessity***: loss of employment, subsistence needs, primary household income from retirement pensions, disability pensions, social assistance, and so on.

This clearly demonstrates that working in a family farm becomes an alternative for many households, helping them reduce the negative impact of the economic crisis on their budgets by seeking opportunities to meet their basic food consumption needs. Many young families have sought a life in the village and find it appealing.

In Figure 8, we can clearly observe an active process of settlement in rural areas, which has continued since the end of 2018, reaching its peak in 2020. Whether socio-economic crises in a society change trends or whether these are short-term personal decisions is a process that we will monitor in the coming years. In order for these processes to be sustainable, the regional policy for rural areas in Bulgaria must focus on: developing a vibrant agricultural sector; diversifying the economic structure in line with local potential; creating alternative sources of employment and income; stabilizing demographic and settlement development; reducing unemployment, increasing incomes; improving access to infrastructure, education, and healthcare, among others. The multifunctionality of the agricultural sector can play a stabilizing role in the rural economy, as family farming is not just an occupation, but rather a way of life compared to most other professions.

The return of the younger generation to active agricultural activity will lead to the recognition of the fundamental importance of small farms for the sustainable development of rural areas. Involving the younger generation in farm ownership and small business development is crucial for rural areas, as in most of these regions, agriculture continues to be the main pillar for economic activity and social structure. This rational behavior of many rural residents is not only a motivation for entrepreneurial spirit but also a potential source of synergistic effects.

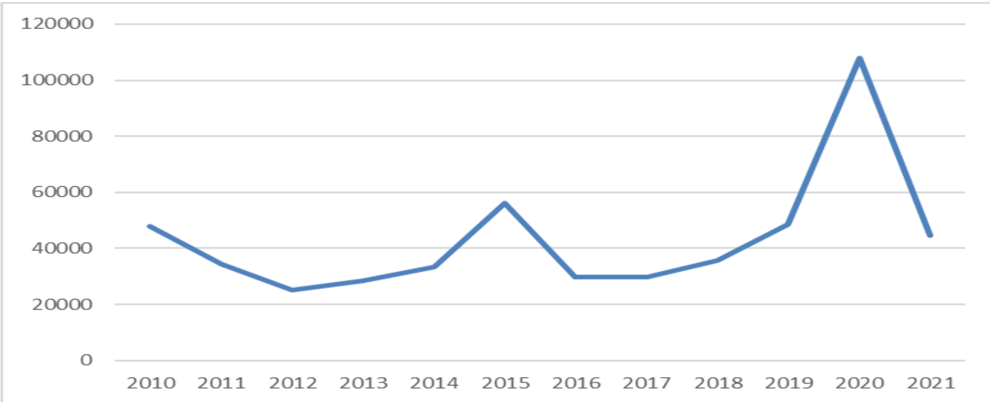

Figure 8. Migration of the population to the villages for the period 2010 – 2021

Source: Own calculations, NSI

Conclusions

As a result of the conducted research, the following conclusions and recommendations can be made regarding the development of agricultural entrepreneurship and institutional changes in Bulgaria:

- A significant number of young entrepreneurs are still not sufficiently familiar with the mechanisms of the Common Agricultural Policy (CAP) for supporting farms. The development of the information network and training will increase their access to public support.
- The majority of farm owners lack the necessary assets to guarantee high productivity and compliance with market requirements for production, quality, and safety. Due to a lack of financial resources, they cannot apply for agricultural and rural development measures.
- The implementation of CAP and support for young people will contribute to balancing the agricultural product market, thus improving the absorption of European funds, which is a prerequisite for increasing competitiveness.

Young farmers bring ideas, knowledge, and energy to the sector, while also driving innovation, productivity, and competitiveness in farms. This inevitable change is something we must face in the next decade when two out of every three agricultural specialists in our country will reach retirement age. Initiatives like this aim to raise awareness about the excellent opportunities this sector offers and, ultimately, attract more young people to agricultural activities. As I mentioned at the beginning, no other food system has guaranteed food security throughout history like family farming and livestock. Given its experience in providing services and the benefits it generates, we, from the government, will work to ensure that this continues in the future. This is our commitment to family and sustainable agriculture.

The successful transfer of the business from one generation to the next is crucial for its sustainability and long-term development. It is important to recognize that this process is not simply a legal or financial matter; it requires careful planning and a strategic approach. Planning the business transfer between generations is a complex but vital process. Through careful planning, training, open communication, and a strategic approach, families will be able to ensure the successful inheritance of the business and its long-term development. Ultimately, a successful transfer is not only a matter of inheritance but also of continuing tradition, innovation, and family commitment to the growth and sustainability of the business. Supporting the next generation of European farmers will not only improve the competitiveness of agriculture in the EU in the future but will also ensure Europe's food security for years to come.

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STATUS AND TRENDS IN THE DEVELOPMENT OF THE BEEKEEPING SECTOR IN BULGARIA

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Abstract
The present study is aimed at the state and trends in the development of beekeeping in Bulgaria. There are not many studies devoted to the problems in the sector, but their importance for the development of beekeeping in Bulgaria is great, therefore clarifying them will improve the development of the sector. The need for the research stems from the fact that, despite the great opportunity for the development of beekeeping available to the country in recent years, the sector is not only not developing, but is facing a catastrophe. The main hypothesis is that beekeeping in Bulgaria, despite the good natural conditions for development, is too far from its potential. This stagnation of the sector has a certain reason. This is where the main goal of the study comes from. To identify the main reason or factor stopping the development of beekeeping in Bulgaria.

For this purpose, the main indicators of the state of beekeeping were analyzed. The main channels for the sale of bee honey and the quantities of production realized through them have been tracked. The largest buyers and sellers in the country have been identified and a comparison of the prices offered by them has been made. The external factors affecting the price and demand for Bulgarian honey have been analyzed. As a result, the reasons and circumstances leading to the negative trends in the sector have been established.

From the conducted research, we have reason to claim that the most significant factor affecting the development of beekeeping is the profitability of a bee colony. As the low profitability, in this case, stems from the adoption of bad legislative policies by the State and the EU, to the detriment of beekeeping. Which have led to price and quality dumping. As a result, local production is forced to sell at unrealistically low prices and the sector finds itself in great difficulty and on the verge of bankruptcy. Interventions are proposed that would help transform the sector into an attractive and profitable business. But a decisive role for the development of beekeeping remains in the hands of the state and European administration and their legal and financial policies aimed at the sector.

Keywords: beekeeping sector, beekeeping, negative trends, honey.
JEL code: Q10, Q12

Introduction

Beekeeping has been the subject of research by various Bulgarian institutions and authors such as the Ministry of Agriculture and Food (MAZH, 2024), the Institute of Animal Breeding Sciences – Kostinbrod (Hristov, 2016) and authors such as (Lyubenov, 2021) (Koprivlenski, 2015) and others. Their reports, opinions and views, although they are aimed at beekeeping, are in different aspects of it or quite early years. The current research is focused on the reasons for the shrinking of the beekeeping sector in the last four years and the possible solutions to overcome this problem.

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The natural features of Bulgaria are very suitable and have predisposed the development of beekeeping in these lands since ancient times. There is (Basheva-Nikolova, 2023), evidence that beekeeping was one of the well-developed crafts at the time of the First Bulgarian Kingdom, even then Bulgarian honey was export-oriented and was sold in various trading centers such as Byzantium, Genoa, etc.
The country's ecosystem is practically very well preserved from pollution, about a quarter of the country's territory is mountainous and semi-mountainous, combined with more than 1100 species of pollinating plants (Hristov, 2016), which are the source of an extremely diverse palette of pollen and nectar. Adding the specific climate of the country, Bulgaria is one of the most suitable places for the production of ecologically clean and high-quality honey. Bulgarian mulberry and nectar honey are distinguished by extremely high taste and healing properties. In addition to the incredible aroma, taste and smell, the biological value is also due to the bouquet of nutrients – 18 types of amino acids, enzymes, vitamins A, C, E, K, B1, B2, B3, B5, B6, B7, B9, trace elements (calcium, phosphorus, magnesium chromium, etc.), natural antibiotic substances (Angelov, 2017). Due to these qualities, Bulgarian honey is a symbol of Bulgaria and finds a place in the most demanding markets in the world.
Despite the good prerequisites for the development of the sector, it is too far from its potential. According to Simova, considering the ecological-geographic characteristics of the country, it is possible to increase the number of bee colonies almost twice and reach 1.3 million bee colonies (Simova, 2007). Which, in turn, would seriously affect employment and improve the socio-economic status of small settlements. The good policy of the country and the EU managed to increase bee families from 529117 in 2012 to 867571 in 2019. But in recent years, low profitability and a sustained negative turn in the number of bee farms and families have been observed. Which is the main problem facing the beekeeping sector in Bulgaria.
The purpose of the research is to identify the main reason or factor stopping the development of beekeeping in Bulgaria and to derive solutions for the optimization of the processes in the development of the sector
To achieve the goal, the following tasks are set:
– To analyze the main indicators of the state of beekeeping;
– To establish and track the main channels for the sale of bee honey, the price and the quantities of production realized through them;
– To analyze the external factors influencing the development of the sector;
– To come up with solutions to optimize the development of the beekeeping sector in Bulgaria.

Methodology

Primary and secondary sources of information were used for the purposes of the study. The primary sources are official documents, statistical and analytical materials of the MHG. Secondary sources are scientific publications and the results of interviews conducted with beekeepers and honey traders, on site and by telephone. Traditional scientific research methods were used: generally scientific – historical and logical; logical-theoretical – comparison, analysis, synthesis, induction, deduction. The study covers the period from 2020 to 01.08.2024.

Analysis of main indicators in the beekeeping sector

In Bulgaria, beekeeping is most developed in the regions of Dobrich, Silistra, Ruse, V. Tarnovo, Pleven in northern Bulgaria and Plovdiv region in southern Bulgaria. With the exception of the Plovdiv region, these are regions with serious socio-economic problems in small settlements. Beekeeping is a form of livelihood and helps to feed and sustain the people employed in the sector and their families in the villages. In order to familiarize ourselves with the state of the sector, we will follow the main indicators related to the development of beekeeping in Bulgaria.

✓ **Number of bee farms**

Since the 2020s, a shrinking of the beekeeping sector has been noticed, mainly by bee farms and families. A process of losing interest in the sector, which has been on a constant rise for the past eight years, is beginning. For 2019/2020, the decrease in bee farms is 15.6%, see graph 1. for 2020/2021 the decrease is 7.1%, for 2021/2022 it is 5.3%, for 2022/2023 is 7.7%. For the considered years, 4,338 owners of bee farms gave up. About a third of the beekeepers in Bulgaria according to data from the Ministry of Agriculture and Food (MAZH) (MAZH, 2024), and the expected forecast for 2024 is a drop of another 7%. In comparison with the Czech Republic, the number of employed in the sector has reached 61,572 beekeepers, and its area is 78,864 km^2, significantly smaller than Bulgaria's area of 110,994 km^2, and the natural conditions are less favorable for beekeeping than the Bulgarian ones.

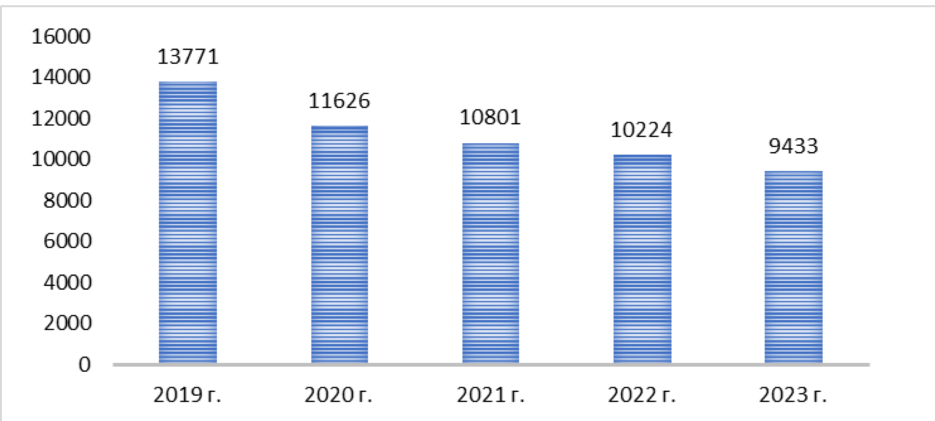

Figure 1. Number of bee farms in the last five years
Source: According to data from the Directorate of Agrostatistics at the Ministry of Agriculture

✓ **Number of bee families**

The situation with bee colonies is a little better than the previous indicator, for 2019/2020 the decrease of bee colonies is insignificant by 0.5% see (fig. 2.), but from 2020/2021 the decrease is already 2.9% for 2021/2022 is 1.8% for 2022/2023 is 0.8%, or by 50,888 bee families have decreased for the period under consideration. The expected forecast for 2024 is a drop of another 5%. All this speaks of a permanent negative trend in the beekeeping sector.

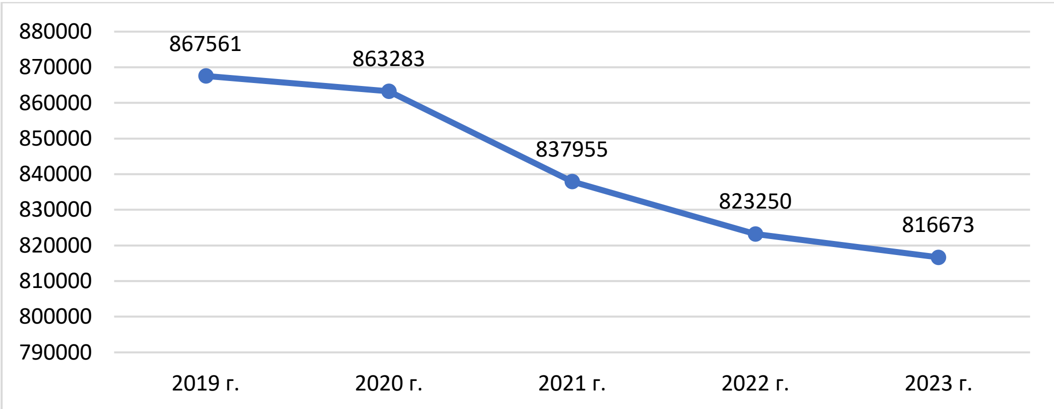

Figure 2. Number of bee colonies in the last five years

Source: According to data from the Directorate of Agrostatistics at the Ministry of Agriculture

✓ **Average number of bee colonies per farm**

The only indicator with a lasting positive trend is the average number of bee families per farm, for 2023 it was 86.6 hives per bee farm, compared to 2020 the average number of families per farm was 74.3, for 2021 it was 77.6 and for 2022 is 80.5. Which shows that there is a stable trend towards the consolidation of bee farms.

✓ **Production of honey**

With the production of honey, the sector has also been doing relatively well in recent years, for 2021 – 11638 tons, for 2022 – 11944 tons, for 2023 – 11189 tons. Average honey yield from one bee colony for 2023 g. – 17.8 kg. These are relatively good indicators, especially considering the climate changes in recent years.

But in addition to the good yield, in order for the producers to be satisfied, it must also be realized at a good price for honey.

Price and realization of bee honey in Bulgaria

Since the main source of income for beekeeping farms is the sale of honey (Lyubenov, 2020), the problems and dissatisfaction in the sector come from the low purchase prices of honey. Honey is sold in Bulgaria mainly through three channels.

- ✓ **Direct sales to the end user**, for 2023, according to the Ministry of Agriculture 2392 items were sold in this line at an average price of BGN 8.96.
- ✓ **Sales to retailers**, for 2023, 483 items were sold at an average price of BGN 7.44.
- ✓ **Wholesale sales to buyers from industry and processing enterprises**, for 2023 are 5,740 items at an average price of BGN 4.40.

The remaining amount of unsold copper of 2574 tons or about a quarter of the production for 2023. are in the warehouses of the beekeepers according to the data from the Ministry of Agriculture (MZH, 2024). This is due to the dissatisfaction of beekeepers with the low purchase price.

At first glance, the listed sales prices in the first two channels do not seem low. But let's not forget that for these sales to happen, the manufacturer must have gone through the investments/expenses not only in production, but also in processing, packaging, logistics, and trade, which costs not only funds but also time, which not everyone has available. Due to these circumstances, the main part of the produced honey goes through the wholesalers.

After the research, the following stood out as some of the most significant buyers of bee honey for Bulgaria: "YOT GI VAL BULGARIA" Ltd., Targovishte, Apimel Ltd., Rakovski, Apitreid, Plovdiv, RAM Commerce Ltd., Maslarevo. Over the years, the prices offered by these traders diverge to a certain extent with the prices indicated by the Ministry of Agriculture, in a negative direction.

Table 1. Purchase prices of bee honey in BGN

Honey wholesalers	**2022 г.**		**2023 г.**		**as of 1.08.2024**		**changed in%**	
	Conven.	Organic	Conven.	Organic	Conven.	Organic	Conven.	Organic
"YOT GI VAL BULGARIA" Ltd., town of Targovishte	BGN **5.5**	BGN **6.5**	BGN **4**	BGN **4.5**	BGN **3.8**	BGN **4.5**	–31%	–31%
Apimel EOOD, town of Rakovski	BGN **5.2**	BGN **6.2**	BGN **3.9**	BGN **4.5**	BGN **4**	BGN **4.6**	–24%	–26%
RAM Commerce Ltd. Maslarevo village	BGN **5**	BGN **6**	BGN **3.8**	BGN **4.3**	BGN **3.8**	BGN **4.3**	–24%	–29%
Apitrede, town of Plovdiv	BGN **5.5**	BGN **6.3**	BGN **3.9**	BGN **4**	BGN **4**	BGN **4.5**	–28%	–29%

As clearly seen in Table 1, prices have been going down in recent years for all four firms. As the cent drop range, between buyers for conventional and organic honey varies between 24% and 31%. The average offered price for conventional honey for

2024 is 3.9 BGN or 1.95 EUR, for organic 4.4 BGN or 2.20 EUR, close to the price of a coffee. Beekeeping companies warn that they expect multiple bankruptcies. A significant part of the beekeeper's state that they did not give up only because there are contracts concluded with the State Agricultural Fund and they are subject to sanctions in case of suspension of activity.

Analysis of the external factors for the development of the sector

Bearing in mind the serious inflation and increase in the prices of raw materials and resources in recent years caused by the Covid pandemic and the invasion of Russia in Ukraine. Even if bee honey had kept the prices of three years ago, bee farms would still have low profitability. Unlike all other goods, the price of which has risen several times. There were appeals from the sector to the Ministry of Agriculture to take adequate measures on the problems. But the intervention of the state was expressed in three compensations for two years of 6/7 BGN per beehive. It cannot be considered that we have compensated the producers' losses with these funds. That ended the state's support to the sector.

According to producers and traders, the reason for the low purchase price of honey is the import of honey from Ukraine. Taken together, the European Union (EU) countries are the second largest honey producers in the world after China. Every year, around 600,000 beekeepers and 17 million hives in the EU produce 250,000 tons of honey. But the consumption of copper in the EU cannot be covered by the production of copper in the union and imports are required. In 2023, the countries of the European Union imported 163,700 tons of honey from third countries, the value exceeding 359.2 million euros. Eurostat (Penchev, 2024) data show. This import was there in the past years as well, but it did not manage to influence the price to such an extent. The price collapse began with the opening of the EU market for honey imports from Ukraine. For 2023, Ukraine has imported 45,800 tons of copper to the EU duty-free. On the one hand, Ukrainian honey manages to undercut the price in the EU, on the other hand, significant quantities of it are brought into Bulgaria, repackaged and exported as Bulgarian. EU member states also do this practice. For 2022, according to official data, 5,000 tons were imported into Bulgaria, of which 3,000 tons came from EU countries, the main ones being Poland and Greece (Agro, 2024). According to Directive 2001/110/EC, when honey originates from more than one Member State or third country, an indication of the countries of origin may be replaced by one of the following indications, as appropriate: "mixture of types of honey originating in the EU", "mixture of types of honey originating outside the EU", "mixture of types of honey with EU and non-EU origin'. considering that the above-mentioned labels are not informative enough and it is very misleading considering the different qualities of honey of each of the EU countries for the final consumer (Erdoş, 2018) The labels also lack data on pollen and other indicators that would precisely differentiate in quality honey. A large part of this so-

called honey, not only does not have its beneficial and healing properties, but also contains products such as glucose-fructose syrup, which is a prerequisite for various diseases. Bee honey is one of the most adulterated products.
Despite numerous protests by beekeepers in previous years, the import of low-quality honey from Ukraine continues to this day. All these processes had a serious impact on beekeepers in Bulgaria.

Conclusion

In summary of the results of the set tasks, it can be argued that the main reason for the negative trends in the beekeeping sector turns out to be the low profitability of the bee colonies. As the main source of income for Bulgarian beekeepers comes from the sale of honey, the reduced demand and low purchase prices on the European markets have a detrimental effect on the development of the sector. The worsening situation on the honey market in this case stems from the adoption of bad legislative policies towards beekeeping by the State and the EU, in favor of non-EU countries. Which have led to the saturation of the market with goods at prices lower than the real ones and of lower quality. As a result, local production is forced to sell at unrealistically low prices and the sector finds itself in great difficulty and on the verge of bankruptcy.
The sector alone will not be able to cope with this crisis in which it is placed. Without serious government intervention, many bankruptcies of bee farms will follow. The worsening situation in which the beekeepers are placed is caused precisely by the implemented policies of the state and the EU towards third countries, and no one other than them can correct them in the right direction. Legislative and administrative changes are needed by the state and the EU. As a result of the research, several recommendations have been made that could stabilize beekeepers financially and help the development of the sector:

– When imported from third countries, the product must undergo laboratory analysis, such as nuclear magnetic resonance tests, which detect bee-specific peptides and other bee-specific markers. In order to ensure full compliance of imported honey and other bee products with EU high quality standards and to detect cases of honey adulteration. In case of non-compliance, strict sanctions should be imposed on the violators;
– Introduce accurate and mandatory labeling of honey and bee products, as well as greater harmonization of legislation on quality and origin schemes for honey production to avoid misleading consumers and facilitate the detection of fraud. By doing so, they tackle both non-EU honey producers who use dishonest methods and EU honey packers and traders who deliberately mix adulterated imported honey with EU honey;

- The survival and stabilization of the sector requires expanding and increasing the financial support of a bee family. Like any payment, whether it is support, compensation or subsidies, it should be based on an accurate analysis of why it is of such an amount. In order to avoid imitation of concern on the part of the institutions;
- The import of bee honey should be tied to setting a minimum price for the EU, when the price falls below a certain percentage, the import should be stopped, when the price rises by the specified percentage, a certain amount of import should be allowed. In this way, beekeepers across the EU will feel much more secure and protected. Beekeeping, apart from being a sector and a livelihood for thousands of people, is also strategically important for the country and for the food security of Bulgaria and the entire EU.

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SOME ASPECTS OF CHANGING THE PURPOSE OF MUNICIPAL PASTURES IN THE REPUBLIC OF BULGARIA

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Abstract

According to the norm of Article 25, Paragraph 1 of the Law on the Ownership and Use of Agricultural Lands, agricultural land that does not belong to citizens, legal entities or the state is municipal property. Municipal ownership of municipal pastures is public and may be declared private municipal property when the purpose of municipal pastures is changed in accordance with the Law on Municipal Property.

Changing the purpose of municipal pastures for the needs of a legal entity and an individual is allowed, according to the regulation of Article 25, Paragraph 7 of the Law on the Ownership and Use of Agricultural Lands, after limited property rights have been established in favor of the person. The change in the purpose of the municipal pastures is carried out in compliance with the terms and conditions of the Law on the Protection of Agricultural Lands. According to the norm of Art. 25, Para. 3 of the Law on the Ownership and Use of Agricultural Lands, a change in the purpose of municipal pastures is permitted as an exception for: construction of technical infrastructure objects, creation of new ones or expansion of construction boundaries of urbanized territories and other cases defined by law.

According to the norm of Article 25, Paragraph 4 of the Law on the Ownership and Use of Agricultural Lands, limited property rights and servitudes may be established on municipal pastures, upon change of purpose.

The conditions and procedure for changing the way of permanent use of municipal pastures for other agricultural needs are defined as a legal technology in the Regulations for the Implementation of the Law on the Ownership and Use of Agricultural Lands and the Law on the Protection of Agricultural Lands.

The bodies that carry out the procedure for changing the purpose are: committees of the regional directorates "Agriculture" and the Commission for Agricultural Lands, according to the regulation of Article 17, Paragraph 1 of the Law on the Protection of Agricultural Lands.

The Minister of Agriculture and Food determines the nominal composition of the commissions to the "Agriculture" regional directorates. These commissions include representatives of the regional structures of the Ministry of Environment and Water, the Ministry of Health, the Directorate for National Construction Control under the Ministry of Regional Development and Public Works, regional administrations, interested agricultural and economic-industrial branch organizations.

The Commission for Agricultural Lands supervises the work of the commissions under the regional directorates "Agriculture".

Keywords: municipal pastures, change of use, agricultural lands, easements, commissions, laws, real rights

JEL: H1, R5

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Introduction

According to the current Bulgarian legislation, municipal pastures, as a type of agricultural land, are public property that belongs to the state and the municipalities. Municipal pastures, in their capacity as a specific type of agricultural land, which is included in the State Land Fund or the Municipal Land Fund, are subject to lease and lease, but limited property rights can also be established on them.

The leasing and leasing of the municipal pastures has been terminated, they are leased to potential users for a certain period under a contract. In this respect, this act is tangential to another agricultural practice – temporary use of agricultural land, analyzed in detail by Velkovska, G. (Velkovska, G., 2019, pp. 210 – 214).

Both pastures from the State Land Fund and pastures from the Municipal Land Fund can be leased or leased without an auction (Article 24, paragraph 2, point 6 and Article 24, paragraph 6, point 4 of the Law on the Ownership and Use of Agricultural Lands – to owners or users of animal breeding sites with grazing farm animals, registered in the Integrated Information System of the Bulgarian Food Safety Agency (www.lex.bg).

According to the text of Art. 24, paragraph 1 of the Law on the Ownership and Use of Agricultural Lands, the ownership of municipalities on municipal pastures from public may be declared private municipal property when the purpose of municipal pastures is changed in accordance with the Law on Municipal Property.

The change of purpose of municipal pastures can therefore be qualified as a legal mechanism for the transformation of ownership of municipal pastures from public to private.

In addition, it should be noted that the change of purpose of municipal pastures is not a legal precedent – the agrarian legislation also regulates the change of purpose of agricultural lands for non-agricultural needs. This topic is analyzed in detail by Velkovska, G. (Velkovska, G. 2022, p. 1135).

Materials and methods

For the purposes of the study, the following were used:

- Literary sources of Bulgarian authors;
- Normative sources (accents from the current legislation);
- Analytical toolkit (normative and analytical methodological apparatus) and survey;
- In this regard and for the purposes of the research, a normative analysis was applied, combined with an analysis of the summarized results of the author's survey.

Results and discussion

Changing the purpose of municipal pastures is related to legal technology, which allows this act only exceptionally.

According to the norm of Article 25, Paragraph 3 of the Law on the Ownership and Use of Agricultural Lands, an exception is allowed for:

a) construction of technical infrastructure sites in the sense of the Territorial Planning Act (www.lex.bg);

b) investment projects that received a certificate for class A or class B investments or for a priority investment project under the Law on the Promotion of Investments, when this was stated during the certification of the project (www.lex.bg);

c) creation of new or expansion of the construction boundaries of the existing urbanized territories (populated places and settlements), as well as creation or expansion of the boundaries of separate regulated land properties outside them;

d) implementation of activities under granted concessions under the Law on Underground Resources and for investment projects related to the socio-economic development of the municipality (www.lex.bg);

e) other cases defined by law.

According to the norm of Article 25, Paragraph 4 of the Law on the Ownership and Use of Agricultural Lands, limited property rights and servitudes may be established on municipal pastures. The text of paragraph 5 of Article 25 of the Law on the Ownership and Use of Agricultural Lands regulates the leading role of the Municipal Council, which adopts a decision to express preliminary consent to change the purpose of municipal pastures from the Municipal Land Fund and to establish limited property rights and easements , with a majority of the total number of municipal councilors in compliance with the special laws and regulations for grassed areas, as well as on the condition that there is no shortage of land for the needs of animal husbandry.

With decisions, the Municipal Council determines the period of validity of the preliminary consent.

The procedure itself in a technological and legal aspect is carried out in accordance with the Law on the Protection of Agricultural Lands.

If a legal entity or individual needs to change the purpose of municipal pastures, the procedure is preceded by the establishment of property rights and servitudes.

The subject of the report is, from the point of view of the regulated practice, the implementation of the act of changing the purpose of the municipal pastures.

The object of research are the effects and problems that arise during this process for natural persons – agricultural producers, users of the municipal pastures.

For the purposes of the study, summarized results of an empirical study on the topic "Change of purpose of municipal pastures" among 87 people – agricultural producers from the South-West planning region are presented.

The summary results of the survey are presented below in the presentation.

The survey covers two sections, namely:

Section I: Profile of the respondent

1. Surveyed farmers from the South-West planning region – 87 people – 100%

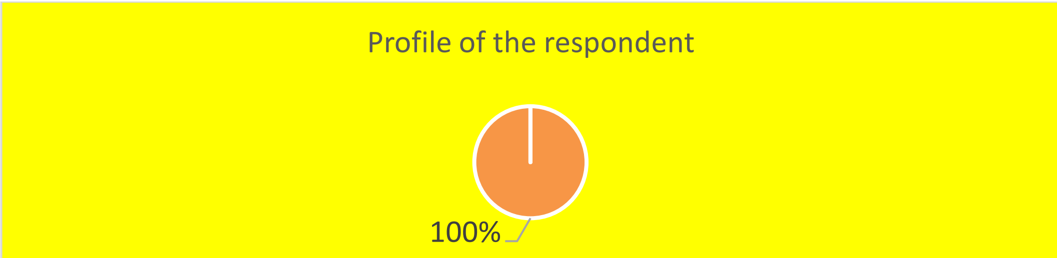

Figure 1. Surveyed farmers from the South-West region for planning

2. Gender structure:
a) men – 51 people or 58.62%
b) women – 36 people or 41.38%

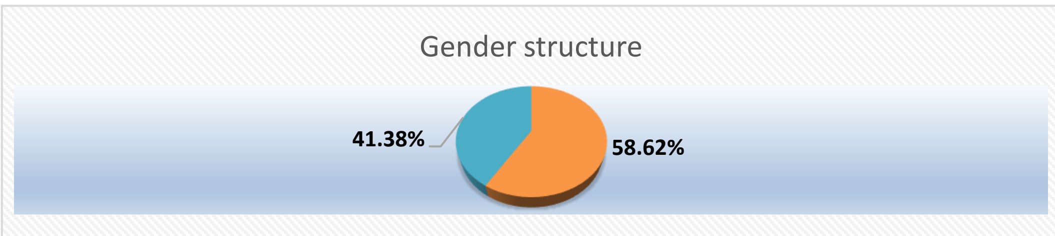

Figure 2. Gender structure

3. Age structure:
a) up to 25 years old – 18 people or 20.69%;
b) up to 35 years old – 27 people or 31.03%;
c) up to 45 years old – 22 people or 25.29%;
d) over 45 years old – 20 people or 22.99%

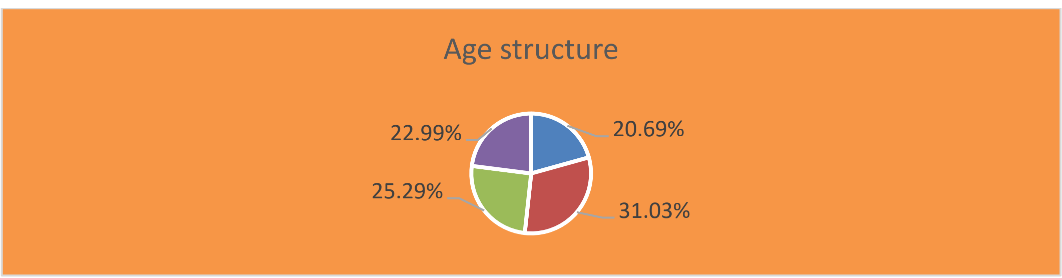

Figure 3. Age structure

4. Internship as agricultural producers:
a) up to 10 years – 15 people or 17.24%;
b) up to 15 years – 27 people or 31.03%;
c) up to 20 years – 20 people or 22.99%;
d) over 20 years old – 25 people or 28.74%.

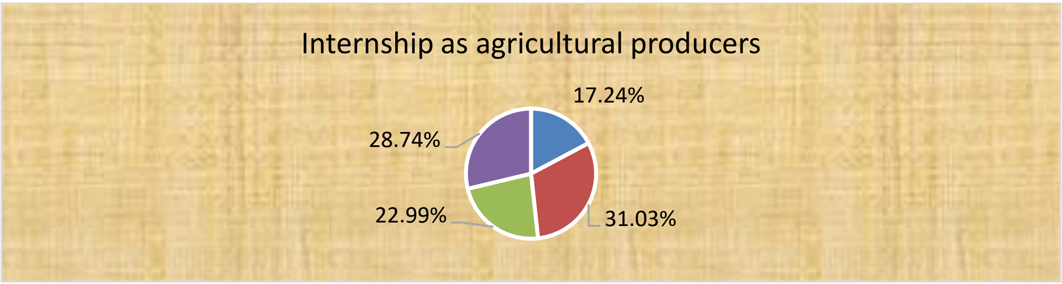

Figure 4. Internship as agricultural producers

Section II: Specialized questions

1. Question: Are you a user of municipal pastures:
a) yes – 87 people or 100%;
b) no – 0 people or 0%.

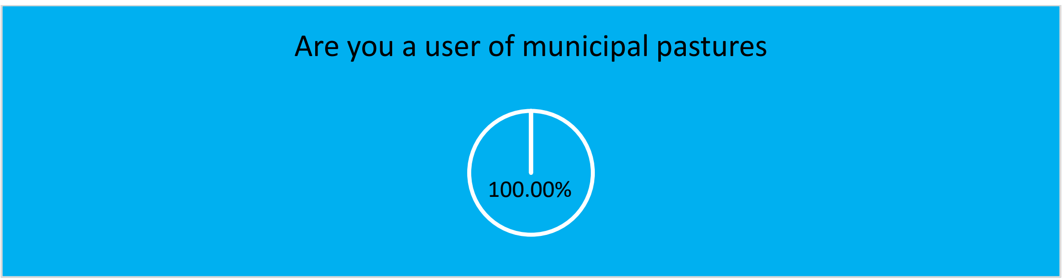

Figure 5. Are you a user of municipal pastures?

2. Question: If your answer to the 1st question is “yes”, have you applied for changing its purpose:
a) yes – 51 people or 58.62%;
b) no – 36 people or 41.38%.

Figure 6. If your answer to the 1st question is "yes", have you applied to change its purpose?

3. Question: Did the municipal agricultural office check what the permanent use of the land is:
a) yes 51 people or 58.62%;
b) not the person or 00.00%

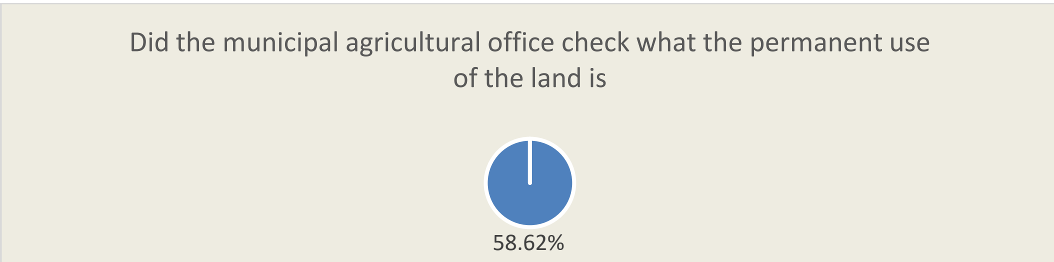

Figure 7. Did the municipal agricultural office check what the permanent use of the land is?

4. Question: If your answer to the previous question is "yes", how did this check go (more than one answer is possible):
a) problem-free – 36 people or 70.58%;
b) fast – 28 people or 54.90%;
c) competently – 26 people or 50.98%

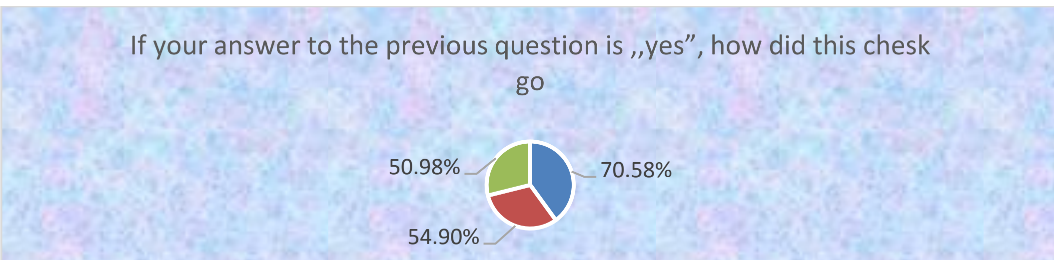

Figure 8. If your answer to the previous question is "yes", how did this check go?

5. Question: If your property is part of permanently grassed areas, have you had a delay in the necessary order for their exclusion from the Minister of Agriculture and Food:
a) yes – 30 people or 58.82%;
b) no – 21 people or 41.18%.

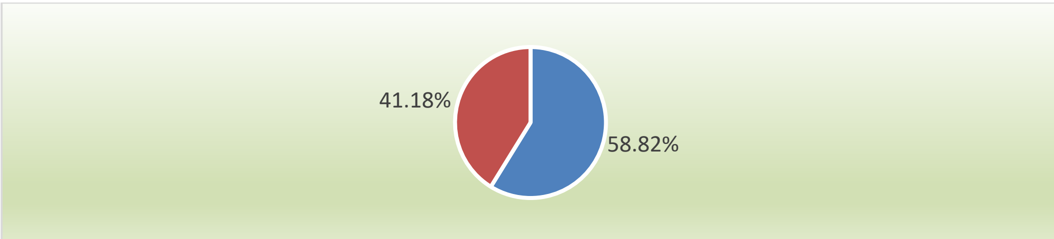

Figure 9. If your property is part of permanently grassed areas, have you had a delay in the necessary order for their exclusion from the Minister of Agriculture and Food?

6. Question: Did you have problems in obtaining a document from the Regional Inspectorate for Environment and Water Protection regarding the absence of prohibitions and restrictions related to the Law on Biological Diversity and the Law on Protected Areas:
a) yes – 32 people or 62.75%;
b) no – 19 people or 37.25%.

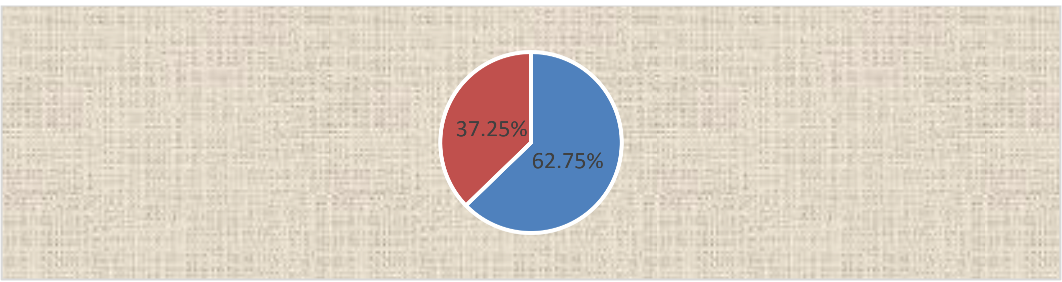

Figure 10. Did you have problems in obtaining a document from the Regional Inspectorate for Environment and Water Protection regarding the absence of prohibitions and restrictions related to the Law on Biological Diversity and the Law on Protected Areas?

7. Question: Do you think that the procedure for changing the purpose of municipal pastures are complicated by (more than one answer is possible):
a) application documents – 43 people or 84.31%;
b) the complexity of the procedures for preparing documents – 51 people or 100.00%;

c) delayed inspections by the municipal office under agriculture – 18 people or 35.29%.

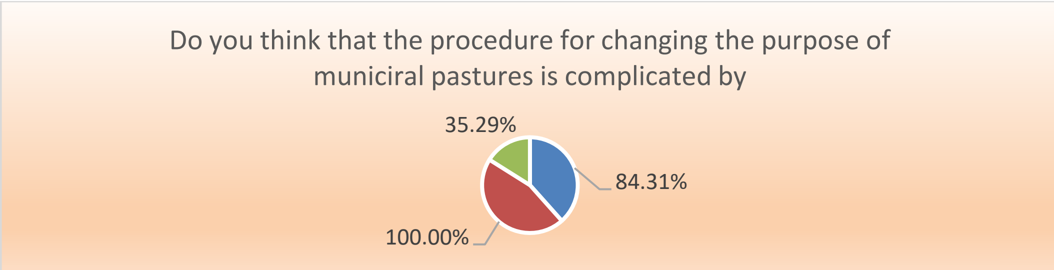

Figure 11. Do you think that the procedure for changing the purpose of municipal pastures is complicated by?

Conclusions

The summary results from the second section of the survey, shown in the presentation, give grounds for forming the following conclusions:

1. The use of municipal pastures is established, given its possibilities and legal regulation, agricultural practice of the users and owners of agricultural lands. All surveyed agricultural producers – 87 people or 100.00% answered that they are users of the municipal pastures;
2. A larger part of the respondents – 51 people or 58.62% applied for a change of purpose of the municipal pastures, probably with already established real rights on these lands as a condition for the change of purpose;
3. All respondents who applied for a change of purpose were checked by the municipal agricultural office regarding the permanent use of municipal pastures – 51 people or 58.62%;
4. A greater part of the inspected respondents – 36 people or 70.58% evaluate the inspection of the municipal agricultural office to establish the permanent use of the municipal pastures as problem-free. The inspection of the municipal service for agriculture was qualified as a quick production – 28 people or 54.90%, which answer is obviously related to the efficiency shown by the inspecting body. 26 people or 50.98% rated the inspection by the municipal agricultural office as competent;
5. On the occasion of the exclusion of permanently grassed areas, as part of the municipal pastures, if such areas exist, and in this connection the issuance of an order by the Minister of Agriculture and Food, it is clear from the answers of the respondents that the majority – 30 people or 58.82% experienced a delay in receiving such an order, which apparently adversely affected the rezoning procedure by delaying that procedure. For 21 people from the respondents or 41.18%, no such delay was found;

6. A serious problem reported by the respondents is the provision of a document from the Regional Inspectorate for Environmental Protection, which certifies the absence of prohibitions and restrictions related to the Law on Biological Diversity and the Law on Protected Territories. 62.85% or 32 people of the respondents had problems in this regard, and the percentage of respondents who answered that they had no problems with the Regional Inspectorate for Environmental Protection was significantly lower – 19 people or 37.25%;
7. Regarding the evaluation of the procedure itself for changing the purpose of the municipal pastures from the point of view of its complexity, 100% or 51 people of the respondents who applied for the change of purpose accept that the complexity of the procedures for preparing documents leads to the complication of the procedure. The application documents were indicated as a complicating factor and circumstance – 43 people or 84.31% of the respondents. Delayed inspections by the Regional Environmental Protection Inspectorate of the Municipal Office of Agriculture were also assessed as a complicating factor, but with the smallest share – 18 people or 35.29%.

In conclusion, it can be noted that still, due to some imperfections of the regulatory framework and to some extent administrative factors, the capacity of this mechanism is not sufficiently effectively used. As some authors point out, changing the purpose of agricultural land as a legal technology and from the point of view of options, can and is applied to the change of purpose of municipal pastures (Velkovska, G., 2022, p. 325). A careful and analytical approach is needed both to the needs of legal entities and individuals to change the purpose of municipal pastures, as well as to preserve and maintain this agricultural resource in the appropriate proportions.

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TRANSITION TO A SUSTAINABLE BLUE ECONOMY – FROM A GLOBAL FRAMEWORK TO A NATIONAL CONTEXT

NIKOLOVA, ATANASKA[1]

Abstract
The sustainable use of ocean and marine resources for economic growth, improved livelihoods and jobs, and the sustainable health of ocean and marine ecosystems is the leading theme of the decade declared by the United Nations General Assembly as the Decade of Ocean Science (Ocean Decade 2021 – 2030).
Global challenges related to climate change, overexploitation of natural resources, environmental pollution, as well as intensive urbanization of coastal areas determine the importance and relevance of the transition to a sustainable blue economy. The topic is particularly relevant for Bulgaria, because the sectors of the blue economy make a significant contribution to the socio-economic development of the country, but due to the vulnerability of the Black Sea ecosystem, the economic potential of the Bulgarian coastal and marine ecosystem is exposed to the risk of anthropogenic and climatic pressure. Despite the challenges, Bulgaria has the potential to transform the Bulgarian Black Sea coast not only into a center of sustainable economic growth, but also into a model for applying the principles of the blue economy.
The publication presents the results of a study whose main objective is to analyze the development of policies related to the transition to a sustainable blue economy in an international, European, regional and national context and to provide an analytical basis for the formation of a recommendations for a policy framework for an effective transition to a sustainable blue economy in Bulgaria. The analytical method applied is a critical review of the framework "external" to the country, which to a large extent regulates the process of transformation of the blue economy sectors, and of key national policies leading the process of transition to the blue economy.
Conclusions are drawn for the policy development process for a sustainable blue economy, and key catalysts for accelerating the transition to a sustainable blue economy are identified, such as improved governance, monitoring and control; changing production and consumption patterns ensuring a transition to a low-carbon economy and society, zero pollution and a circular economy; focus on technological innovations and science-based ocean solutions; and involving stakeholders in the process.
Recommendations are also formulated for making a transition to a sustainable blue economy at the national level, including changing the models of isolated sector management and investment and developing a national policy framework to provide a platform for improved governance and coordination between institutions and stakeholders in blue economy sectors.
Keywords: sustainable development, blue economy, governance.
JEL code: Q01; Q56

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Introduction

Oceans, seas and coastal areas have a great potential to support and accelerate the economic growth, and at the same time are seen as the new economic frontier due to increasing number of industries competing for the resources of the oceans and seas. Interest in the economic potential of the ocean is growing rapidly, and the ocean's contribution to the global value added is projected to reach over USD 3 trillion by 2030 (OECD, 2016). Maritime industries, considered as traditional, such as maritime transport, maritime and coastal tourism, fisheries driven by global economic growth and increasing demand have the potential to grow fast by 3% – 4% annually over the coming decades (Nash, KL and others, 2017). With the development of science and technology, new ocean-based economic sectors (emerging industries), such as marine renewable energies, blue carbon capture, marine biotechnology and sustainable mining activities. All these industries and sectors related to the oceans, seas and coasts form the so-called "blue economy" (Fig. 1).

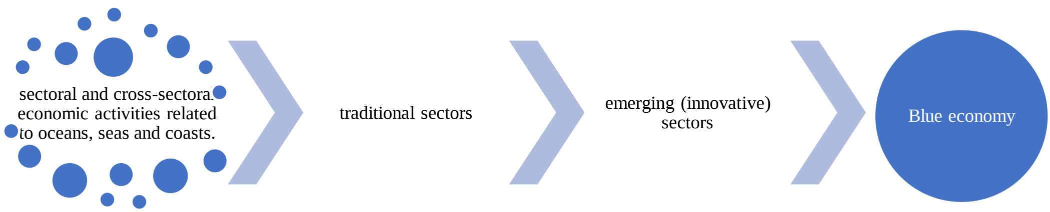

Figure 1. Sectors and industries included in the scope of the blue economy – dynamics

Source: Author's research

As a result of anthropogenic pressures, oceans, seas and marine resources are increasingly threatened, degraded or destroyed, reducing their ability to provide vital ecosystem services. The main threats are, among others, climate change, marine pollution, unsustainable extraction of marine resources and the physical changes and destruction of marine and coastal habitats and landscapes. Researchers, including Bennett, NJ and others (2019), conclude that a transformation of the way people perceive, manage and use the oceans, seas and coasts is required in order to protect the ocean health and human wellbeing.

The blue economy or sustainable ocean – based economy is emerging in response to this increased international pressure on ocean and sea resources and is setting a new trend of growth that is both environmentally sustainable and socially just. According to authors (Cisneros-Montemayor, 2019), the achievement of the triple goals (economic, social, environmental) requires many changes in industrial development, policy planning and attitudes regarding social and environmental problems and can be seen as an opportunity to move towards ambitious social and environmental goals. The combination of economic activities included in the concept of blue economy must contribute to: (i) provide social and economic benefits for current and future generations; (ii) restore, protect and maintain the diversity, productivity, resilience, essential functions and intrinsic value of marine ecosystems; and (iii) be based on clean technologies, renewable energy and circular material flows that will reduce waste and promote material recycling (WWF, 2015). The need of transformation in production and consumption patterns, as well as improved management and control of human activities, gives impetus to the gradual development of conceptual scientific models, policies and regulation, as well as good practices, including technological solutions and innovations aimed at achieving the goals of sustainable development (WB, 2019). This transformation is led at the international level by the UN, OECD, World Bank, EC.

Although there is a lack of a common definition, the scientific and institutional publications are united in the understanding that the sustainable blue economy is not simply a term uniting economic sectors dependent on the resources of the oceans, seas and their coasts, but above all a term describing an integrated maritime policy, a tool for achieving sustainable development, considering the three aspects – social, economic and environmental. Since the Rio+20 conference (UN DESA, 2021), the sustainable blue economy is seen as an ambitious framework for ocean governance, applying a result-oriented management approach and requiring the involvement of both institutions and stakeholders.

Methodology

The publication presents the results of a study whose main objective is to analyze the development of strategic policy frameworks for ocean governance, related to the transition to a sustainable blue economy on international, European, regional and national level and to provide an analytical basis for the formation of a recommendations for a policy framework for an effective transition to a sustainable blue economy in Bulgaria.

The methodology used includes a literature review and study of official documents of international organizations and institutions (UN, OECD, EC, World Bank, etc.), national strategic documents and scientific publications on the subject.

The survey examines successively international, European, regional and national contexts. The publication includes the international conventions, political commitments, strategies and programs adopted at the global level analyses the contribution of the European Union to the development of policies and tools for a sustainable blue economy, as well as the contribution of the regional Black Sea cooperation in policy formulation and implementation, and focuses on the national context.

The analytical method applied is a critical review of the framework “external” to the country, which to a large extent regulates the process of transformation of the

blue economy sectors, and of key national policies leading the process of transition to the blue economy.
Conclusions are drawn for the policy development process for a sustainable blue economy, and key catalysts for accelerating the transition to a sustainable blue economy are identified. On the base of the analysis and findings, the recommendations are also formulated for improving the strategic framework on the national level.

Blue economy policy development – an international context
Figure 2 presents important steps taken by the international community in the transition to a sustainable blue economy.

Figure 2. Sustainable blue economy – international framework for policy development

Source: Author's research

Already at the end of the 1950s, humanity's concern for the oceans and the marine environment and for the overexploitation of their resources led to the adoption of the UN Convention on the Law of the Sea (UN, 1982) – a fundamental document that aims to improve security, cooperation and economic and social progress and regulates the protection, use and study of the seas and oceans and their resources.
The importance of oceans for sustainable development is widely recognized by the international community and is embodied in Chapter 17 "Protecting oceans, all seas and coastal zones, and the conservation, rational use and development of their living resources' of 'Agenda 21' (UNDSD, 1992) – the main document adopted at the first Earth Summit organized by the United Nations in Rio de Janeiro, Brazil. Chapter 17 recognizes the "marine environment" (including the oceans and all seas and adjacent coastal areas) as an asset that provides opportunities for sustainable development, and whose protection requires new approaches to the management and development of marine and coastal areas at national, sub-regional, regional and global level.

The concept of “blue economy” was formalized in 2012 at the UN Conference on Sustainable Development (Rio+20). It is a response to growing concern in the international scientific community that the resources of the seas and oceans are limited and that the health of the planet's “blue heart” is drastically deteriorating. In the Rio+20 outcome document (UNCSD, 2012) The Future We Want Report, paragraphs 158 to 180, states reiterated the importance of “conserving and sustainably using the oceans and seas and their resources for sustainable development, development, including through their contribution to poverty eradication, sustainable economic growth, food security and the creation of sustainable livelihoods and decent work, while protecting biodiversity and the marine environment and addressing the impacts of climate change”.

At the UN Summit on 2015 the Member States unite and adopt a final document (UN General Assembly, 2015) – “Transforming our world: The 2030 Agenda for Sustainable Development”, which also includes Goal 14: “Conserve and sustainably use the oceans, seas and marine resources for sustainable development”. Goal 14 reaffirms the importance of ocean issues on the global agenda and places ocean health at the heart of sustainable development. On the base of the achievements of science and innovation the international community continues its efforts to restore the oceans and seas and to implement Goal 14. In order to develop a sustainable and equitable ocean economy by 2030 significant advancements in establishing a knowledge-driven framework for informed decision-making and policy formulation is needed. The sustainable use of ocean and marine resources for sustainable economic growth is a leading theme of the decade, announced by the UN General Assembly as the Decade of Ocean Science (Ocean Decade 2021 – 2030).

European contribution to policy development

To the ongoing deterioration of the quality of the marine environment, loss of biodiversity and unsustainable use of oceans, seas and coastal areas, the European Commission and Member States are responding with efforts to overcome the fragmentation of sectoral marine policies and decision-making processes and to introduce a comprehensive and more coherent policy framework. The maritime policy of the Union is based on the principles of taking no preventive action, prioritizing the removal of damages to the marine environment at their source, and the polluter pays. Figure 3 traces the main steps in the development of European policy for the transition to a sustainable blue economy.

In its document Strategic Objectives 2005 – 2009 (Commission of EC, 2005), the European Commission called for an integrated approach to maritime policies. In October 2007, the Commission launched the “Integrated Maritime Policy for the European Union” (EC Commission, 2007(1)) – a policy framework which aims to promote the sustainable development of all maritime activities and of coastal regions by improving the coordination of policies affecting the oceans, seas, islands, coastal and outermost regions and maritime sectors, as well as through the development of cross-sectoral tools. The Integrated Maritime Policy gives impetus to the development of important initiatives, among which: “Blue Growth” – a long-term strategy adopted in 2012 to unlock the potential of the blue economy and support the development of sustainable maritime economic activities (EC, 2012 (1)); Marine Knowledge 2020: roadmap – a response to the need for adequate data and knowledge about the marine environment for the sustainable development of activities related to the sea (European Commission, 2014); Marine Spatial Planning, regulated through Directive 2014/89/EU (EC, 2014) – a response to the increasing human impact on the oceans, together with the rapidly increasing demand and competition for marine space for various purposes. The aim is to promote the sustainable growth of maritime economies and the use of marine resources through better conflict management and greater interaction between different maritime activities.

Figure 3. Sustainable blue economy – European context for policy development
Source: Author's research

During the period 2019 – 2024, reflecting the European Green Deal (EC, 2019) as Europe’s sustainable growth strategy, EC and member states have put forward reforms and investments aiming to achieve a sustainable low-carbon, resource-efficient and circular European economy and society. The blue economy is considered a key pillar for achieving the objectives of the European Green Deal and related EU strategies due to the significant role and importance of the ocean as a climate regulator, a source of “clean” energy, oxygen, food and other critical humanity resources Considering the importance of the healthy oceans the EC called for a new approach making a transition from ‘Blue Growth’ to a ‘Sustainable Blue Economy’ and developed “A New Approach for a Sustainable Blue Economy in the EU – Transforming the EU Blue Economy for a Sustainable Future" (EC, 2021) that ensures coherence between and facilitates the coexistence of blue economy sectors, and seeks synergies in the maritime space, without to harm the environment. The analysis of European policies in the field shows that the ambitious policy of the EU and the declared intention of the blue economy to be the engine of the "green" transformation put maritime industries under great pressure. The transformation focuses on key areas of action such as achieving climate neutrality and zero pollution; moving to a circular economy; protecting biodiversity and investing in nature by ensuring the ecological protection of 30% of the EU's marine territory; climate change adaptation and coastal resilience; sustainable food production; approving the management of the maritime space To achieve these ambitious goals and to make this transformation happen, support with adequate regulatory and financial incentives and tools is needed.

Regional context – Black Sea Basin

Regional marine conventions, sea basin strategies and plans are strategic instruments aiming to coordinate the efforts on the regional scale to protect the marine environment. They can be a forum for sharing knowledge and making legally binding decisions. Figure 4 presents key steps in the transition to a sustainable blue economy in the Black Sea region.

Figure 4. Transition to a sustainable blue economy – Black Sea context

Source: Author's research

The Convention for the Protection of the Black Sea from Pollution, adopted in 1992 in Bucharest, reflects the concern of the six Black Sea states about the deteriorating ecological condition of the Black Sea. The parties to the convention undertake to cooperate with each other and with other parties to establish appropriate scientific criteria for determining rules, standards, recommended practices and procedures for the prevention, reduction and control of pollution of the marine environment of the

Black Sea. As a result, in 2009, Sofia adopted a Strategic Action Plan for the protection and restoration of the Black Sea, which requires considering the activities in the coastal areas and their impact on the state of the marine environment.
The EC's call for the implementation of an Integrated Maritime Policy (EC Commission, 2007(2)) directs efforts of the EC and the Black Sea countries towards better coordination and in 2008 the initiative for Black Sea regional cooperation called "Black Sea Synergy" was announced.
An important step accelerating the regional cooperation in the Black Sea region is the initiated by Bulgaria and Romania and approved on 21 May 2019 by the Ministers of the Black Sea countries "The Common Agenda for the Black Sea" (CMA). This strategic document is a unique strategic framework for the blue economy, strengthening the regional dialogue between participating parties and stakeholders to jointly address the challenges and opportunities of the blue economy sectors in the region, ensuring environmental sustainability while promoting growth and promoting blue economy projects. The overall Black Sea agenda is complemented by its science pillar, the Black Sea Strategic Research and Innovation Program (SRIA), which provides valuable data for science-based decision-making. The Common Maritime Program for the Black Sea focuses on the development of a competitive, innovative and sustainable blue economy, as well as the promotion of investments in the Black Sea blue economy.
The two strategic documents represent a good basis for the development and implementation of regulatory and financial instruments for the transformation of the blue economy sectors to a sustainable mode, as well as for changing the management model of marine and coastal areas to apply the principles of integrated sustainable development.

National context

Bulgarian blue economy includes all sectors related to the sea and coastal areas, including coastal and marine tourism, marine living resources, maritime transport, port activities, shipbuilding and repair, and marine non-living resources, etc. These sectors are the backbone of the blue economy of Bulgaria, and they depend on the quality of the natural ecosystems (World Bank, 2020). This is a large and fast-growing segment of the Bulgarian economy, which has taken significant steps to modernize and diversify over the last decade, and which will play an important role in improving environmental, social and economic development. The development of the blue economy can decisively stimulate growth and economic development, as well as the creation of jobs in Bulgaria
At the same time, the economic potential of the Bulgarian coastal and marine ecosystem is exposed at risk from anthropogenic and climatic pressures. Urbanization, pollution, the impact of climate change – all these natural and anthropogenic impacts are putting serious pressure on the coast.

Bulgaria is progressing in harmonization of legislation and in aligning the sectoral policies with the EU blue economy framework. Some of the important strategic documents, that facilitate the transition to the sustainable blue economy are presented on Figure 5. The lack of a national vision/strategy or other type of framework document to provide a platform for improved governance and coordination between institutions and stakeholders in the blue economy sectors, as well as to define priority maritime sectors was identified.

Figure 5. National strategic documents supporting the transition to a sustainable blue economy
Source: Author's research

An important step towards a more sustainable use of the Black Sea and its more effective protection, as well as towards transition to a sustainable blue economy in Bulgaria is the adoption of the Maritime Spatial Plan of the Republic of Bulgaria (MPPRB) for the period 2021 – 2035, developed in fulfillment of the obligations of the country under EU framework directives (Water Framework Directive (2000/60/EU); Marine Strategy Framework Directive (2008/56/EC and Directive 2014/89/EU to establish a framework for maritime spatial planning). The increased competition between economic sectors and urban development for marine and coastal resources and territory, as well as the continued deterioration of marine environment and the loss of biodiversity, necessitating the implementation of an integrated maritime policy. One of the main objectives of the Maritime Spatial Plan of the Republic of Bulgaria (MSPRB) is "creating conditions for sustainable growth of the maritime economy", as well as reconciling existing and future activities on the use of marine spaces and efficient use of natural resources. At this stage, it is not possible to assess the effect of the adoption and implementation of the MSPRB. A next step of the study is to assess the extent to which the document fulfills the role of a political tool for the transition to a sustainable blue economy at the national level and to draw conclusions and recommendations for upgrading and improving the instrument.

Although the country formally fulfills its commitments under international agreements, as well as transposing European legislation, the practical implementation of policies and the achievement of key goals remains a challenge for Bulgaria. The fact is indicative that after the finalization of the Maritime Strategy of the Republic of Bulgaria and the program of measures for the period 2016 – 2021 (adopted by RMS No. 1111 of 29.12.2016 in implementation of the Framework Directive on Maritime Strategy 2008/56/EC) Bulgaria does not achieve a good state of the marine environment for the most of the monitored indicators, and in the new period a large part of the planned measures are of an institutional nature, including ensuring effective coordination between the competent authorities for the implementation of the Marine Strategy.

The study shows that despite the recommendations in international and European documents Bulgaria does not fully apply the ecosystem approach in the development of strategic documents (in particular the MSPRB), as well as the process of evaluating ecosystem services has not been completed. This is considered as a key to providing information on which to base policy decisions for the sustainable growth of maritime industries.

The conducted study concludes that in Bulgaria have not been applied a governance approach to ensure a balance between economic growth, the protection of the welfare and rights of the local community, and the protection of the environment.

There is a contradiction in the priorities and goals of the sectoral, cross-sectoral policies regulating the sectors of blue economy, and the horizontal policies related to the welfare and rights of the local community, and the protection of the environment. The policies do not adequately address the challenges to the sustainable development of the blue economy in Bulgaria, and do not sustainably engage the interested parties in the stages of policy development, implementation, monitoring and evaluation. Stakeholder involvement is theorized as a key element for evidence-based, transparent policy-making. The study of national policies and strategic documents shows that there is a lack of a single national database, oriented towards the sectors of the blue economy and enabling the evaluation of the effectiveness of policies, as well as the NSI does not maintain national statistics on the indicators by which, at the European level, an annual assessment of the state of the blue economy.

This report analyzes the context for the transition to a sustainable blue economy in Bulgaria and creates a basis for subsequent analysis of the challenges and opportunities facing Bulgaria's transition to a blue economy.

Conclusions

The Blue Economy is a concept that focuses on the sustainable use of ocean and maritime resources for economic growth, improved livelihoods and jobs, and the lasting health of ocean and maritime ecosystems, applying a holistic and interdisciplinary approach integrating the principles of marine science, environmental protection, socio-economic development.

Global challenges related to climate change, overexploitation of natural resources, environmental pollution, as well as intensive urbanization of coastal areas determine the importance and relevance of the transition to a sustainable blue economy. For Bulgaria, the topic is particularly relevant due to the following circumstances: (1) the sectors of the blue economy have a significant contribution to the socio-economic development of the country; (2) vulnerability of the Black Sea ecosystem – the economic potential of the Bulgarian coastal and marine ecosystem is at risk from anthropogenic and climatic pressure; (3) despite the challenges, Bulgaria has the potential to transform the Bulgarian Black Sea coast into an example of sustainable economic growth and a model for applying the principles of the blue economy.

The method of analysis used is a critical review of the framework "external" to the country, which to a large extent regulates the process of transformation of the maritime economic sectors and of the fundamental policies for the transition to the development of a blue economy. The study traces the development of policies related to the transition to a sustainable blue economy in an international, European, regional and national context. The analysis finds that in international, European, regional and national contexts policy instruments have been developed and implemented to achieve a sustainable blue economy. The analysis forces the conclusion that the process of developing policies for a sustainable blue economy requires the involvement of both institutions at all levels of government and stakeholders. The transition to a sustainable blue economy requires a change in production and consumption patterns; improved management and control of human activities; a focus on scientific discoveries and technological innovations ensuring a transition to a low-carbon economy and society, zero pollution and a circular economy. Although our country formally fulfills its commitments under international agreements, as well as transposes European law, the practical implementation of policies and the achievement of key goals remain a challenge for Bulgaria. Based on the identified weaknesses and gaps identified in a national context, recommendations are made for the necessary actions, including reforms and policies for full compliance with the EU framework for the blue economy, as well as with the international agreements and initiatives to which our country has joined. Emphasis is placed on the need to adopt a national vision/strategy or other type of framework policy document to provide a platform for improved governance and coordination between institutions and stakeholders in the blue economy sectors, as well as to define priority maritime sectors for development. This also requires changing the models of sectoral management and investments to integrated one; the improvement of the utilized policy instruments and data base; the valuation of natural capital and ecosystem services is an important tool.

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SLUDGE FROM WASTEWATER TREATMENT PLANTS IN BULGARIA – WASTE OR RESOURCE

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Abstract
Environmental pollution leads to significant economic losses, which arise from the costs of waste treatment and management. The need for sustainable management and effective prevention and control measures is essential to reduce these negative impacts and ensure long-term economic growth and social well-being. At the same time, waste represents an opportunity to generate economic value through recycling, composting and the use of waste as raw materials. The management of waste streams and the market for secondary raw materials presents both significant challenges and many opportunities for the modern world. Proper understanding, sustainable management and appropriate utilization of these resources can initiate a new model of interaction with the environment, which in turn can contribute to achieving significant economic and environmental benefits.
The object of this study is the sludge from wastewater treatment plants as part of specific waste streams, as well as their management activities and reporting values presented for a 10-year period within Bulgaria. The aggregates related to the sludge generation and recovery activities of the Wastewater Treatment Plants (WWTPs) in Bulgaria have been subject to a dynamic development during the last decade. The focus is on their recovery as a resource and not only as a waste.
The thesis that by proper treatment, sludge can be transformed into a resource that can in turn be used appropriately in various processes is discussed. This can reduce the need for primary resources and contribute to the sustainable development of particular economic sectors by, for example, favoring intensive farming/agriculture activities and the implications this brings.
The main objective of this paper is to classify the main types of waste streams and to look at the current status of sewage sludge and the opportunities for its reuse in the economic cycle. The main challenges and opportunities in the sector will be identified, as well as current effective management strategies and policies. An overview is also given of the legislative framework for sludge management in Bulgaria and the European Union, which plays a key role in regulating sludge recovery. It is essential to note that, under European legislation, sludge is safe where proper management is in place. With that being said, and in the light of the ongoing trends towards sustainable development, there is an increasing need to focus attention on this direction by applying specific sustainable methods for their recovery.
The report highlights the importance of sustainable sludge management, with a strong emphasis on the need to continue efforts for sustainable sludge management in Bulgaria and in general.
Key words: sewage sludge from wastewater treatment plants, agriculture, utilization, recycling, waste management
JEL code: Q12, Q15, Q19

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The provision of food for the population poses significant challenges for the agricultural sector. The continuously increasing demand for agricultural products is being addressed through the implementation of intensive farming practices, which are also associated with negative consequences such as environmental pollution. This leads to significant economic losses, including the costs associated with waste treatment and management. At the same time, waste represents an opportunity for generating economic value through recycling, composting, and its use as raw materials. In response to these challenges, the European Union's Green Deal, adopted in 2019, sets ambitious goals related to reducing greenhouse gas emissions, limiting the use of mineral fertilizers and pesticides, and increasing the area under organic farming by 2030 *(The European Green Deal, 2019)*. The need for sustainable environmental management through the implementation of effective pollution prevention and control measures is essential for mitigating these negative impacts and ensuring long-term economic growth and social well-being.

With proper treatment, waste can be transformed into a resource that can be utilized in various processes, including compost production, bioenergy generation, and secondary raw materials. This can reduce the need for primary resources and contribute to the sustainable development of specific economic sectors. The management of waste streams and the market for secondary raw materials presents both significant challenges and numerous opportunities for the modern world. Proper understanding, sustainable management, and appropriate utilization of these resources can initiate a new model of interaction with the environment, which, in turn, can contribute to achieving significant economic and environmental benefits.

In the context of the above, this study will examine the sludge from wastewater treatment plants (WWTPs) as part of specific waste streams that, through appropriate processing, can be utilized as a renewable resource in agriculture, specifically as a soil amendment for fertilization.

The primary objective of this study is to classify the main types of waste streams and to examine the current state of WWTP sludge as well as the opportunities for their reuse in the economic cycle. It will identify the main challenges and opportunities in the sector, along with current effective management strategies and policies.

In order to achieve the above objectives, the following tasks are set in the development:

- to provide a classification of the waste streams including sludge from the WWTP;
- To review the legislative framework and current policies for the management of sewage sludge in Bulgaria and the EU;
- to provide statistics on the sludge generated by WWTPs by districts and years in the country and the methods of recycling and reuse of WWTP sludge;

- to draw conclusions on the opportunities, constraints and prospects for the sector in Bulgaria.

Classification of waste

In Bulgaria, the main types of waste streams can be classified according to different criteria, and the list of wastes is being supplemented and amended in accordance with scientific and technical progress. The main regulatory document governing this classification in Bulgaria is Ordinance No 2 of 23 July 2014 on waste classification, which provides a systematic approach to waste classification. This classification provides a framework for the management of waste, considering its origin, composition and potential hazard. It is an important tool for regulators, businesses and municipalities when planning and implementing sustainable waste management measures. *(Regulation No. 2, 2014)*

The main types of waste streams are divided into the following categories:

1. General waste categories, which includes municipal waste, construction and demolition waste, and manufacturing waste;
2. Specialized waste categories, combining hazardous waste – medical and veterinary waste, waste from electrical and electronic appliances;
3. The category by type of material, which includes metal waste, plastic waste, paper and cardboard waste, glass waste;
4. A category by origin that combines agricultural waste, mineral waste, water treatment waste and water treatment waste, where waste generated from wastewater treatment and sludge removal falls[1] .
5. Another category is waste from specific activities, which includes waste from food production and processing, waste from the chemical industry, waste from energy production.

The object of this work are sludges from wastewater treatment from settlements described according to the qualification of Ordinance No. 2 of 23.07.2014 on waste classification.

Sewage sludge is also subject to classification, which includes many aspects related to its origin, composition, level of treatment and recovery options. Distinguishing these in a proper way is complex but at the same time essential for the effective management and recovery of these sludges and minimizing their impact on the environment (*Regulation No. 6, 2000).*

[1] The sludge generated in a WWTP is an organic product that results from the treatment of wastewater after the settling of residual substances. It is generated by the separation of these residual products during the various stages in the wastewater treatment process and contains valuable agricultural constituents (including organic matter, nitrogen, phosphorus, potassium and, to a lesser extent, calcium, sulphur and magnesium).

First, the sediments can be separated by their origin. Urban sludge is generated from the treatment of wastewater from households, public buildings and commercial establishments. Industrial sludges originate from industrial plants such as chemical plants, the food industry and the textile industry. The classification also regulates cases where wastewater from different sources is treated together, these are so-called mixed sludges.

The second category covers sludges according to their composition. Organic sludges contain a high amount of biodegradable materials such as food residues and plant and animal materials. Mineral sludges, on the other hand, are composed mainly of inorganic materials such as sand, clay and metal oxides. Mixed sludges contain both organic and inorganic components.

The next classification is according to the level of treatment. Raw sludges are those that have not undergone further treatment after initial settling. Stabilized sludges have undergone a stabilization process, such as anaerobic digestion, to reduce the organic content and limit the growth of pathogens. Dewatered sludges are those where a significant portion of the water has been removed to facilitate subsequent treatment or disposal. Thermally treated sludges have undergone incineration or other thermal treatment, which further reduces their volume and destroys organic material and pathogens.

The fourth category addresses sludge recovery options. Some sludges can be used as soil improvers in agriculture after undergoing appropriate additional treatment processes. Others can be composted and used as organic fertilizer. There are also sludges that can be recovered for energy production by incineration or anaerobic digestion. Those that cannot be recovered are landfilled.

The hazard classification divides sludge into non-hazardous and hazardous. Non-hazardous sludges do not contain significant quantities of hazardous substances and can be recovered or disposed of with lower environmental risks. Hazardous sludges contain harmful substances such as heavy metals, toxic chemicals or pathogens that require special treatment and disposal.

Sediments can also be classified according to the origin of the contaminants. Some sludges contain a high level of biodegradable organic matter and are known as sludges with organic contaminants. Others contain heavy metals, minerals and other inorganic compounds and are classified as sludges with inorganic contaminants. There are also sludges with microbiological contamination which contain pathogenic micro-organisms and viruses and require special disinfection measures.

As mixed sewage systems prevail in the country, which receive both domestic and industrial wastewater, part of the sludge generated by MSWWTPs is classified as “hazardous waste” within the meaning of *Ordinance No. 2 of 23.07.2014 on waste classification*. As the Sludge Ordinance does not allow for the recovery of sludge that is or contains hazardous waste, it is excluded as an option for agricultural use and is not of interest as a subject of analysis in the development *(Ordinance No. 2, 2014).*

In order to clarify the possibilities and limitations for the use of sewage sludge for fertilization in agricultural areas, a review of the current legislative and regulatory framework in the country was carried out.

Legislative and regulatory framework for the use of sludge from WWTPs

The legislative and regulatory framework for sewage sludge management is a leading and structurally determining factor for the functioning of various sectors in the country such as water, agriculture, waste management, etc. The main objective of the rules and regulations established for the management and subsequent utilization of sewage sludge is to regulate its use in a way that prevents harmful effects on soil, vegetation, animals and humans when it is used for fertilization.

In the European Union, sludge recovery is regulated by *Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture*.

It maintains its added value as the only legal regulatory instrument providing an EU framework for soil protection in the use of sludge in agriculture by setting a minimum level of harmonization to control pollution and health risks. At the same time, it provides the possibility for each country to build on national legislation with more stringent requirements. The Directive sets out how this type of waste should be managed, considering its valuable properties. It encourages use and recommends increasing the quantities to be used in agriculture if and only if they are used on areas where they do not have a negative impact on soil and agricultural production *(Directive 86/278/EEC, 1986).*

The main requirements set out in the document boil down to compliance with limits related to the content of heavy metals and biogenic elements (*cadmium, copper, nickel, lead, zinc, mercury, chromium*) in sediments and soils, as well as limits on the annual sediment load on agricultural land. It also provides for mandatory biological, chemical or thermal treatment of sludge before its use for fertilization *(Directive 86/278/EEC, 1986).*

The legislation prohibits the use of sludge in the following cases:

- when concentrations of heavy metals exceed specified limit values;
- on the soil in which fruit and vegetable crops are grown, with the exception of fruit trees;
- on grassland or forage land that will be grazed by animals or mown in the coming three weeks;
- less than ten months before the harvest of fruit and vegetable crops, when the crops are in direct contact with the soil and eaten raw.

In parallel with advances in the understanding of sludge properties, treatment and use, the broader environmental legislative and policy framework is changing significantly. There are wide variations in implementation, linked to the fact that sludge management depends on local conditions or policy choices by Member States. A similar example can be given with the heavy metal thresholds and parameters introduced by the Directive. Over time, seventeen Member States have reviewed and adopted stricter limits for both existing and additional pollutants. However, with the upgrading of technologies and methods for sludge treatment in wastewater treatment plants, their heavy metal levels have developed positively over time and have shown a significant decrease to a level below the limits set in the Directive.

The Directive applies in accordance with the waste hierarchy set out in the *Waste Framework Directive*. Its objectives are aligned with other environmental and health legislation and related policies outlined in the *Zero Pollution Action Plan* and the *EU Soil Strategy 2030 (EU Action Plan, 2022), (EU Soil Strategy, 2022).*

More broadly, Directive 86/278/EEC supports Europe's new sustainable growth agenda – the *European Green Deal* and EU policies on climate, health, circular economy, food security and the independence of fertilizer s, critical raw materials and energy. These policies influence sediment management policies differently depending on local conditions, for example agronomic soil needs, energy mix and available infrastructure.

The European Green Pact, on the other hand, aims to promote growth by moving towards a modern, resource-efficient and competitive economy. As part of this transition, several EU waste laws are subject to revision. One of the main building blocks of the European Green Deal is the *Circular Economy Action Plan (CEAP)*, which was adopted by the European Commission in March 2020. The EU's transition to a circular economy aims to reduce pressure on natural resources and create sustainable growth and jobs. The Action Plan introduces legislative and non-legislative measures targeting areas where action at EU level brings real added value, with one of the objectives sets being to ensure less waste *(CEAP, 2020)*.

In the context of the *Green Pact* and circular economy requirements, an assessment of the Circular Economy Action Plan has been carried out. It establishes the relevance of the Directive and highlights the effectiveness of using sludge in agriculture as a basic and significantly cheaper alternative to incineration. The use of sludge in agriculture is strategically considered in the context of sustainable development, zero pollution and climate change in EU policies. The importance of flexibility is underlined, given that sludge management is highly dependent on local conditions. The assessment also points to the lack of data on the use of sludge in agriculture and ongoing research on this issue *(The European Green Deal, 2019).*

Bulgaria's national legislation on the use of sewage sludge in agriculture, which is constantly being developed and refined, is part of the country's environmental policy and is harmonized with the European one. In 2007, when Bulgaria was accepted as a member of the EU, it started to comply with the requirements and regulations of the EC. In this regard, the regulation has been introduced through relevant normative documents in key areas, and to align with the European standards after the country's accession to the EU, a *National Strategic Plan for the Management of Sludge from Wastewater Treatment Plants in Bulgaria for the period 2014 – 2020* has been adopted *(NSPMSWTP, 2014).*

The requirements of Directive 86/278/EEC have been introduced into our national legislation by means of *an Ordinance on the procedure for the recovery of sludges from wastewater treatment through their use in agriculture*. It applies to sludges from sewage treatment plants and wastewater facilities in urban and other areas with a similar composition to municipal water. It defines: the procedure and method for the recovery of sludge through its use in agriculture and for the recovery of sludge in land reclamation; the requirements for producers and users of sludge intended for recovery in agriculture in a manner that ensures that its application will not have a harmful effect on soil, vegetation, animals and humans; the procedure for reporting on the sludge recovered; the permitting regime for the use of sludge from GSSW; and the methods for sampling and testing sludge and soils (*Regulation, 2017*).

In line with European legislation, Bulgaria has also adopted a *National Strategic Waste Management Plan*, the latest version of which is in force for the period 2021–2028. As a result of the implementation of the program, a plan is set to provide infrastructure for the recovery of sludge from MSWTPs, reducing greenhouse gas emissions and to have an electronic system up and running for the products offered from treated sludge from MSWTPs for use in agriculture and for the reclamation of disturbed land. The set target is expected to be realized by 2040 (*NWMP, 2021).*

The institutional framework also includes other government policies, programs, plans, and instruments that legislate both the management and the options for the subsequent utilization of sludge in agriculture and other industries.

Such regulatory requirements are contained in official documents, the main part of which is related to environmental management legislation through *the Environmental Protection Act (EPA, 2023)*, water through *the Water Act (Water Act, 2000)*, soil through *the Soil Act (Soil Act, 2018)*, agricultural land through *the Agricultural Land Conservation Act (ALCA, 2024.)*, waste through *the Waste Management Act (WMA, 2024)*. It regulates the application of penalties and sanctions for non-compliance with established conditions in the use of sludge from WWTP in agriculture.

Generated and recovered sludge from WWTPs in Bulgaria

The generation and subsequent recovery of sewage sludge in Bulgaria is an important aspect of waste management and sustainable development. As required by legislation, the EEA publishes annual reports on the management of sewage sludge. On the basis of this information, *Annex 1* to this report shows the quantities

of non-hazardous sludge generated by WWTPs by territory for the respective Regional Environment and Water Inspectorates (REWIs), ranked in descending order of the responsible population for each respective region for 2023.
In the context of the published data, between 2012 and 2022[1] in Bulgaria an uneven trend of increasing amounts of generated non-hazardous sludge from WWTPs is reported. The main reason for this is the expansion of the network of WWTPs in the country, from 85 active WWTPs providing data in 2012 to 100 in 2022. However, the upward trend continued until 2016, including the peak in reported sludge generation, with a total of 65742.65 tons/dry weight (wt) from all WWTPs.
In 2020, there is a significant decrease in the values of sludge generated with a total amount of 33 473.35 tons/dry wt. Over the next few years, the values start to increase significantly, almost doubling in 2022 to a total of 57 514.55 tons/dry wt.
Surprisingly, population numbers do not seem to have an impact on the total amounts of non-hazardous sediment generated, which inevitably raises questions in its wake.
The only variable that tends to increase its share in each subsequent year and is independent of the other variables is the share of RIEW Sofia, which in 2014 is 49.22% for 54 939.34 tons/dry wt of non-hazardous sludge generated, compared to 60.96% for 2022 with almost the same amount of sludge generated of 57 514.55 tons/dry wt.
According to European legislation, under proper management, sludge from MSWW is safe waste for nature and human health. In fact, there are several options for the recovery and disposal of this type of waste stream. Some of these are long-standing practices, for example, their reuse as fertilizer and soil conditioner on agricultural land and reclamation on non-economic land. Another already well-established sustainable method is their use for fertilizer and biogas production, which has been introduced in Bulgaria since 2018. The oldest and most inefficient method, which has the most negative environmental and health impacts, and which still occupies a significant share in management activities is sludge disposal. In the context of the data summarized in *Annex 2* of this paper, in the 10-year period considered (2012-2022), there is a positive trend in the reduction of the share of landfilled sludge, which in 2014 occupied 15.42% of the total amount of treated sludge, and in 2022 this amount melts to 2.52%.
Significant growth in the share of sludge used in agriculture has been observed over a 4-year period with a progressively increasing share from 29.78% in 2014 to 56.13% in 2018 for all activity categories combined. However, in the last 2 reporting years, there has been a decline with 18,616.29 tons/dry wt. of sludge recovered in agriculture or 32.37% of the total being reported for 2022, which is one of the lowest values for the ten-year period under consideration.

[1] The EEA has not provided public data on sludge management from WWTPs for 2017.

Over the past four years, there has been a positive shift in the development of fertilizer and biogas production activities, with a 7-fold increase in its figures between 2018 and 2022, reaching an impressive 34.84% in 2022.

Conclusion

The analysis of statistical information on sludge generated and subsequently recovered from WWTPs shows that the amount of sludge has been increasing over the last ten years. In the context of the circular economy strategy, there is a trend to reduce landfilling and increase recovery methods through agricultural application and reclamation. There has been significant progress in the sustainable recovery of this waste resource, but there is also a perceived need for further efforts to improve technologies and increase the environmental and economic benefits of these processes.

Data for the first few years of our study indicate that landfilling was the preferred method of sludge disposal. During the period under review, the trend regarding the quantities of sludge applied to agriculture has been maintained, with the waste from the RIEW Sofia being the determinant of this quantity. These form the picture of sludge use at national level, as over the years the reported data from other treatment plants that utilize their sludge in this way is scarce. The information from the Sofia WWTP dominates the overall picture on sludge management in the country with 60.96% for 2022 of the total amounts of non-hazardous sludge produced.

A large part of the non-hazardous sludge in Bulgaria – 80.09% in 2022 – meets the necessary conditions in terms of its quality composition for fertilization in agriculture and satisfies the legal requirements of Directive 86/278/EEC, but only 32.37% of it is actually recovered in the soil.

A high proportion of sludge is stored temporarily on the drying fields of the treatment plants. Although they have analytically proven good quality character-ristics, no environmentally sound use has been found for them.

Achieving higher performance on sludge use in agriculture is a process of establishing and implementing a strong legislative national policy. In this context, it can be concluded that Bulgaria has a modern legislative and regulatory framework for the safe use of sludge in agriculture, which is based on modern European standards.

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Annex 1: Amount of non-hazardous sludge in Bulgaria for the period 2012 $ 2022

Amount of sludge, tons/dry weight (wt)		2012		2014		2016		2018		2020		2022	
REWIs	Sofia	29 168,14	49,22%	27 039,60	49,22%	32 959,00	50,13%	23 101,00	43,57%	16828,393	50,27%	35 058,00	60,96%
	Plovdiv	5 620,00	9,48%	3 824,52	6,96%	3 206,40	4,88%	4 810,00	9,07%	4249,59	12,70%	3 984,49	6,93%
	Varna	5 146,84	8,69%	7 612,09	13,86%	9 227,20	14,04%	2 899,32	5,47%	3089,159	9,23%	4 226,24	7,35%
	Burgas	6 541,34	11,04%	2 745,50	5,00%	2 653,75	4,04%	3 319,94	6,26%	2368,625	7,08%	2 052,42	3,57%
	Ruse	2 090,53	3,53%	2 815,00	5,12%	6 555,00	9,97%	6 614,46	12,48%	136,226	0,41%	1 538,67	2,68%
	Stara Zagora	3 173,80	5,36%	2 014,88	3,67%	1 924,40	2,93%	2 061,40	3,89%	530,332	1,58%	2 294,44	3,99%
	Pleven	1 679,00	2,83%	2 216,20	4,03%	1 684,00	2,56%	1 996,02	3,76%	1519,445	4,54%	2 871,20	4,99%
	Blagoevgrad	882,38	1,49%	302,75	0,55%	749,75	1,14%	777,95	1,47%	567,482	1,70%	490,64	0,85%
	Pazardzhik	724,68	1,22%	889,81	1,62%	548,00	0,83%	841,26	1,59%	962,01	2,87%	1 053,00	1,83%
	Pernik	248,19	0,42%	302,83	0,55%	336,46	0,51%	240,59	0,45%	-	-	-	-
	Veliko Tarnovo	1 655,06	2,79%	1 811,69	3,30%	2 123,00	3,23%	1 499,68	2,83%	1474,789	4,41%	773,52	1,34%
	Haskovo	400,83	0,68%	667,00	1,21%	586,93	0,89%	2 810,36	5,30%	464,23	1,39%	1 812,66	3,15%
	Shumen	755,94	1,28%	850,40	1,55%	966,33	1,47%	876,22	1,65%	760,438	2,27%	931,05	1,62%
	Vratsa	390,00	0,66%	49,45	0,09%	433,91	0,66%	606,53	1,14%	522,632	1,56%	206,07	0,36%
	Montana	364,37	0,61%	523,29	0,95%	1 250,70	1,90%	356,54	0,67%	-	-	202,96	0,35%
	Smolyan	419,98	0,71%	1 274,33	2,32%	537,82	0,82%	209,08	0,39%	-	-	19,19	0,03%
Amount of non-hazardous sludge, total tons/dry wt		**59 261,08**		**54 939,34**		**65 742,65**		**53 020,35**		**33 473,35**		**57 514,55**	
Existing WWTPs providing data		**85**		**87**		**97**		**100**		**75**		**100**	
												Source: EEA	

Annex 2: Treated sludge by activity operations in Bulgaria for the period 2012 – 2022

	Sludge management activities	2012		2014		2016		2018		2020		2022	
Sludge amount, tons/dry wt	Deposed	-	0,00%	8 472,15	15,42%	6 180,02	9,39%	3 740,87	7,05%	1 604,60	4,79%	1 447,34	2,52%
	Temporarily preserved	-	0,00%	22 292,74	40,58%	18 679,01	28,39%	10 763,01	20,28%	5 119,98	15,30%	11 453,75	19,91%
	Used in agriculture	-	0,00%	16 363	29,78%	26 229,46	39,87%	29 797,00	56,13%	16 929,34	50,58%	18 616,29	32,37%
	Reclamation of disturbed landscapes	-	0,00%	6 964,36	12,68%	11 439,70	17,39%	5 908,75	11,13%	6 228,84	18,61%	5 957,70	10,36%
	Organic composting with red Californian worms for bio-fertilizer	-	0,00%	847,09	1,54%	3 263,99	4,96%	-	0,00%	-	0,00%	-	0,00%
	Production of fertilizer and biogas	-	-	-	-	-	-	2 874,00	5,41%	3 590,58	10,73%	20 039,48	34,84%
	Total	**0,00**		**54 939,34**		**65 792,18**		**53 083,63**		**33 473,35**		**57 514,55**	
Amount of treated sludge		0,00	0,00%	32 646,60	59,42%	47 113,17	71,61%	42 320,62	79,72%	28 353,37	84,70%	46 060,81	80,09%
												Source: EEA	

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COMPARATIVE ANALYSIS OF THE ADVANTAGES AND LIMITATIONS OF ACTION-BASED AND PERFORMANCE-BASED AGRI-ENVIRONMENT SCHEMES

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Abstract
The majority of agri-environment payments (AEPs) in the European Union (EU) are action-based payment schemes that impose specific agricultural management requirements on farmers. These schemes offer clear and specific instructions for farmers, making them easier to understand and implement. They also provide stable and predictable income which helps farmers with handling the financial risks. However, they do not always deliver the desired environmental outcomes and their effectiveness in protecting biodiversity is limited. This paper outlines some of the limitations of the action-based ecological schemes including their lack of flexibility when it comes to addressing the specific needs and conditions of the farmland and their economic inefficiency as in some cases resources are being spend on actions that do not always lead to significant environmental benefits. To increase their effectiveness, it may be useful to integrate result-based schemes that link payments to specific ecological results. Result-based ecological schemes give freedom to farmers to adapt their farming practices to the specific conditions of their land. They provide financial incentives for farmers to achieve measurable environmental benefits such as improved biodiversity, water quality, soil health and other ecosystem services. Existing result-based payments are mainly aimed at maintaining threatened habitats or priority species for conservation. This type of payments give freedom to farmers to adapt their farming practices to the specific conditions of their land. In general, result-based agri-environmental schemes are successful when the cause-effect relationships between farming practices and environmental objectives are well established and can be represented by single or combined indicators. Despite the distinct advantages, results-based schemes face certain challenges – not all biodiversity targets can be measured by indicators; isolation and fragmentation of species and habitats; increased economic risk for farmers; need for appropriate advisory support. To overcome the specific limitations of the two types of environmental schemes, it would be useful to consider a hybrid approach that combines payments for actions and payments for results. The current report provides examples for the implementation of result-based schemes in Germany, Switzerland and Ireland. These countries were selected as they have one of the longest running and best designed result-based payment schemes in Europe. They can be used as a basis for the further development and application of result-based schemes. The aim of this report is to discuss the advantages and limitations of action-based and result-based agri-environment schemes. A comparative analysis of the two types of agri-environmental schemes was carried out based on the existing scientific literature.
Key words: Agri-environment schemes; Agri-environment payments; Result-based schemes; Action-based schemes; Biodiversity
JEL codes: Q14, Q18, Q20

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Introduction

The agricultural sector plays a key role in the development of the world economy. It is a sector that the world's population depends on to provide for its food supply and can be expected to become increasingly important in the future as demands on food quality and production methods increase. Agriculture depends on a well-functioning environment, but is also responsible for some harmful effects on it (Bartkowski et al., 2021). On the one hand, farmers are strongly affected by environmental changes, such as climate change and the deterioration of arable land quality (Jägermeyr et al., 2021; Bartkowski et al., 2021). On the other hand, agriculture has significant impacts on soils, water quality, air and biodiversity (Yordanova and Garkova, 2019). One way to address the problems associated with environmental degradation and biodiversity loss is to implement agri-environment schemes, which provide payments to farmers for changing existing or adopting new agricultural practices to achieve environmental benefits.
The agri-environment schemes implemented under the Common Agricultural Policy (CAP) provide the policy framework for sustainable agriculture in Europe and represent the largest source of funding for effective nature conservation in the European Union (EU). There are two main types of agri-environment payments (AEPs) – action-based and result-based schemes. The majority of AEPs in the EU are action-based payment schemes (Bartkowski et al., 2021), which impose specific requirements on farmers for agricultural management. These schemes vary considerably from country to country and cover different objectives, such as maintaining species-rich grassland (high nature value lands), maintaining hay meadows under certain mowing regimes, or reducing the use of agrochemicals. On arable land, it usually involves the implementation of measures such as field boundaries, planting and maintaining hedges, putting up bird houses, etc.
The aim of this report is to discuss the advantages and limitations of action-based and result-based agri-environment schemes.
The methodological approach applied is a comparative analysis of the two types of agri-environmental schemes implemented in Europe. It is based on a literature review of scientific publications focused on agri-environment schemes.

Advantages and limitations of action-based agri-environment schemes

Agri-environment schemes were established in 1985 as a way of compensating farmers for income they lost when implementing less intensive and more environmentally friendly agricultural management practices. In 1992, the AES as a financial instrument of the CAP became mandatory for all EU Member States, with each country developing its own programme. Farmer participation remains voluntary, although following the CAP reform in 2014, some practices became mandatory for farmers seeking to receive a basic subsidy (Lécuyer et al., 2021). These schemes can be applied both horizontally (across the whole country), e.g. supporting organic farming, and zonally, within areas of high natural value (Lécuyer et al., 2021; Batáry et al., 2015). These

include both cultivated land and uncultivated areas, such as wildflower strips (Lécuyer et al., 2021). One of the main criticisms of traditional, action-based AESs is that their success is measured by the level of farmer participation rather than the achievement of actual environmental improvements (Lécuyer et al., 2021; Herzon et al., 2018).
A review of monitoring data on action-based agri-environment schemes shows that they do not provide the expected biodiversity benefits (Elmiger et al., 2023). One of the reasons for their limited effectiveness according to Elmiger et al. (2023) is that they do not take sufficient account of local environmental features. Other reasons are due to the lack of flexible payment conditions, which prevents farmers from adapting the measures to the specific conditions of their farms (Bredemeier et al., 2022), and the inability to inspire long-term behavioural change in participating farmers (Batáry et al., 2015).
Various research studies (Batáry et al., 2015; Burton & Schwarz, 2013) highlight some key advantages and limitations of action-based agri-environment schemes.

Advantages

1. Clarity: action-based schemes offer clear and specific instructions for farmers, making them easier to understand and implement (Burton & Schwarz, 2013). Farmers are more likely to comply when they know exactly what is expected of them, leading to higher levels of participation (Primdahl et al., 2010).
2. Predictable and stable income: these schemes provide stable and predictable income for farmers, as payments are linked to the performance of specific actions rather than outcomes, which may be subject to external factors (Engel, 2016). This stability helps to reduce financial risks for farmers, which encourages wider adoption of sustainable practices (Meyer et al., 2015).
3. Promote specific practices: action-based schemes promote specific, ecologically beneficial practices such as planting hedgerows, creating buffer zones and reducing chemical inputs, which can lead to gradual ecological improvements (Kleijn et al., 2006).
4. Standardization: By prescribing specific actions, these schemes help standardize certain agroecological practices across regions (Whittingham, 2007).

Limitations

1. Lack of focus on ecological outcomes: action-based rather than results-based payments do not ensure that desired ecological outcomes are achieved because they do not focus on measurable improvements in biodiversity or ecosystem services (Kleijn et al., 2019; Whittingham, 2011).
2. Poor targeting: action-based AES are often applied the same across different regions. As a result, resources may be allocated to places where they are less needed or are less effective. Therefore, they may fail to address specific local

environmental challenges, thus weakening the overall impact of the scheme (Batáry et al., 2015).

3. Lack of flexibility: action-based schemes may be too restrictive, not allowing farmers to adapt their actions to the specific needs and conditions of their land, which may reduce the effectiveness of the measures (Bazzan et al., 2022; Burton & Schwarz, 2013). Lack of flexibility may hinder innovation as farmers are less willing to experiment with new practices that might be more effective in specific contexts (Herzon et al., 2018).
4. Economic inefficiency: as payments are not linked to actual environmental outcomes, there is a risk that resources will be spent on actions that do not lead to significant environmental benefits, raising questions about the cost-effectiveness of these schemes (Batáry et al., 2015).
5. Evaluation problems: it is difficult to evaluate the effectiveness of these schemes when the main measure is the performance of actions rather than the ecological effect (Uthes & Matzdorf, 2013).
6. Administrative burden: Monitoring and verifying the implementation of prescribed actions can require significant administrative resources, increasing the overall costs of schemes (Lankoski, 2016). The implementation of action-based schemes often involves complex bureaucratic processes, which can hinder farmer participation and complicate scheme implementation (Primdahl et al., 2010).

Action-based AESs have some significant advantages such as clarity, predictable incentives and the promotion of standardised sustainable practices. However, one of the significant criticisms of these types of schemes is that they fail to influence farmers' attitudes towards the environment or change their behaviour and are therefore ineffective in the long term (O'Rourke, 2020). Their focus remains limited in terms of tangible measurable outcomes, adaptation of practices to address farmers' specific needs, economic and environmental efficiency. Integrating results-based schemes that link payments to specific environmental outcomes could be beneficial for overcoming some of the limitations that action-based schemes pose.

Advantages and limitations of result-based agri-environment schemes

Agri-environment payments for results are mechanisms for rewarding farmers on the basis of environmental results achieved, rather than on the performance of predetermined actions. Although there is no single accepted definition of what constitutes an agri-environmental result-based payment scheme, there are several key definitions and concepts used to describe these schemes in the scientific literature. According to the Organization for Economic Co-operation and Development (OECD), agri-environmental result-based payments are payments that are linked to observable and measurable environmental outcomes related to specific objectives such as improved biodiversity, water quality, soil condition and other ecosystem services

(OECD, 2010). The European Commission defines agri-environment outcome payments as financial incentives provided to farmers for achieving specific environmental results rather than for implementing specific practices or actions (EC, 2018). Kleijn et al. (2006) propose a definition that focuses on the measurement and specificity of the outcomes. They describe payment for results as financial compensation provided for the achievement of clearly defined and measurable environmental and sustainable agriculture objectives. According to other authors (Hanley et al., 2012), payment for results are schemes in which farmers are rewarded based on measurable environmental outcomes, providing a direct link between farmers' efforts and the environmental benefits received. This approach assumes that farmers have the freedom to choose how best to achieve these outcomes.

Advantages

1. Flexibility and innovation. One of the main advantages of result-based schemes is that they encourage innovation by allowing farmers to choose how to achieve environmental objectives, rather than limiting them to specific actions. This flexibility can lead to more effective and context-specific solutions. Fewer restrictions and regulations make result-based payments more attractive to farmers (Elmiger et al., 2023).
2. Measurable results: Establishing specific, measurable, achievable, realistic and time-bound (SMART) goals help guide farmers' activities (Lankoski, 2016). Results-based AES help to build a direct link between payments and achieved environmental outcomes, such as biodiversity conservation and improvement, water and soil quality, or carbon sequestration (Kleijn et al., 2006; Burton & Schwarz, 2013). According to Batáry et al. (2015), result-oriented AEPs can have a better effect on biodiversity than traditional AESs because they reward actual conservation outcomes rather than compliance with management prescriptions. This focus on tangible outcomes makes schemes more effective in achieving environmental goals compared to action-based schemes (Herzon et al., 2018).
3. Cost-effectiveness: payments for environmental performance have the potential to optimise costs, as funds are only spent when real environmental benefits are achieved.
4. Adaptability to local contexts: result-based payments give farmers autonomy and freedom to use their existing knowledge about the specific context of farming systems (O'Rourke, 2020). This makes the approach more adaptable to different local conditions and regional characteristics.

Limitations

1. Difficulties in measuring results: one of the most serious challenges for results-based AES is developing reliable indicators that accurately reflect environmental improvements (Herzon et al., 2018). These types of schemes are limited to cases where causal links between agricultural practices and environmental objectives are well established and can be represented by single or combined indicators.

Some agro-ecological interactions are very complex, operate at specific spatial and time-scales, can vary even within small spaces and short distances, and not all biodiversity objectives can be measured by indicators (O'Rourke, 2020). Changes in habitats may respond slowly to changes in land management practices due to the slow-down of ecosystem processes and may not be captured by indicators for a long time. The time lag between management inputs and ecosystem management outcomes may also complicate monitoring and payment, and this would make these types of schemes less attractive to farmers (O'Rourke, 2020).

2. Increased risk and uncertainty: result-oriented agri-environment schemes are associated with increased risk for farmers, as the outcome of land management practices may depend on factors beyond their control: farmers' behaviour on neighbouring land; natural processes – weather conditions, pest infestation, diseases, parasites; different life cycle stages of migratory species may occur in different geographical locations. While action-oriented AEPs can provide a reliable source of funding (with risks transferred to the state), outcome schemes do not offer such certainty. This requires effective risk management to be considered in the design of results-based AE programmes.
3. High transaction and monitoring costs: the implementation of AES for outcome is often associated with significant transaction and monitoring costs due to the need for reliable systems to verify outcomes. Therefore, such schemes are only implemented in settings where monitoring costs are reasonably low (Bartkowski et al., 2021).

By their very nature and compared to payments for actions, AEPs for results represent an innovative approach in agri-environment policy. This method aims to improve the efficiency and sustainability of farming practices by providing financial incentives for farmers to achieve measurable environmental benefits such as improved biodiversity, water quality, soil health and other ecosystem services. Most result-based measures implemented to date target species-rich grasslands and aim to conserve plant rather than animal species; in part because mobile animals are more difficult to monitor and are dependent on conditions in adjacent fields, and in the case of migratory birds, on differing conditions across countries and continents (O'Rourke & Finn, 2020). Existing result-based AEPs are mainly aimed at maintaining threatened habitats or priority species for conservation. This makes them more suited to maintaining existing habitats (where farmers can use their management expertise) rather than restoring or re-creating habitats (O'Rourke & Finn, 2020). Typically, these are semi-natural habitats, High Nature Value (HNV) land, where low-cost farming practices have been applied for a long time, with Natura 2000 sites being the highest priority.

Examples of agri-environment schemes for results from European countries

The first result-based agri-environmental scheme projects were implemented in the early 2000s, with one of the longest running and best-known schemes being the

MEKA programme ('Extensive Grassland Management'), introduced in 2000 and co-funded by the CAP, focusing on species-rich grasslands in Baden-Württemberg and later in Lower Saxony in Germany. Under this scheme, farmers received payments if their meadows contained four of a list of 28 indicator plant species. In the periods 2000 – 2009 and 2009 – 2014, the scheme was hybrid and farmers received outcome payments in addition to payments for extensive grassland management actions. In the 2014 – 2020 programming period, a two-tier 'stand-alone' payment has been introduced, amounting to €230/ha for four indicator species and €260/ha for six indicator species, and the result-based measure could not be combined with other action-based measures, as it was before 2014. Over 9000 farmers participated in the programme covering an area of 66 112 ha.

Other examples of earlier results-oriented schemes are the Swiss biodiversity conservation programme Proof of Ecological Performance (PEP) and the Irish Burren programme.

PEP started in Switzerland in 1998 and continues to operate to this day. To qualify for direct payments, farmers must comply with a set of environmental and animal welfare standards. One of the requirements for farmers is to grow specific crops (vines, fruit and vegetables) on at least 3.5% of the utilised agricultural area (UAA) of the farm. Farmers receive additional payments for so-called Ecological Focus Areas (EFA) provided they apply farming practices to protect biodiversity (balanced use of fertilisers, regulated crop rotations, appropriate soil protection, targeted use of plant protection products) on at least 7% of the UAA. Ecological target areas include grasslands, pastures, orchards, wildflower strips, etc. (Jan et al., 2024). In 2020, the share of ecological target areas that are part of the management-based payment scheme amounts to 19% of total UAA. On average, farmers received payments for achieved results for 43.3% of these areas (excluding trees). (Jan et al., 2024).

One of the best designed and longest running AES for results is the Burren programme, which started in Ireland in 2005 with twenty pilot farms covering 2500 ha of priority habitats. In present days there are 328 participating farms covering an area of 23,000 ha. Over the last 10 years the programme has actively worked to protect and enhance cultural heritage and landscapes; sustainably managing high nature value farmland; and improving water quality and efficient water use in the Burren region. The programme has initiated a 5-year applied research project called 'Burren LIFE' which is developing a plan for sustainable agriculture in the region. The Burren programme applies a “hybrid” approach, using two key interventions: Intervention 1 (I-1) is direct payments for achieved environmental results and Intervention 2 (I-2) to receive additional support by implementing activities (up to 5 activities within the contract and the allocated budget) to protect the environment. The Burren programme does not take a holistic approach to farming: currently only species-rich areas are targeted, although Intervention 2 activities can also be carried out in species-poor areas to ensure better management of the targeted areas. The

success of the Burren program is due to its tailor-made approach to local needs and specificities, the leading role of farmers, the innovative payment system and the strong spirit of partnership between stakeholders.
Result-based agri-environmental payments are widely regarded as the future direction for the European agriculture however there are certain obstacles that they are faced with. On one hand result-based schemes require advanced monitoring and measurement of the desired outcomes. On the other hand, there is uncertainty of payment due to some external environmental factors that are beyond farmers' control. This kind of risk associated with result-based payments make them less appealing to farmers compared to action-based payments. (Bartkowski et al., 2021). A hybrid approach involving direct payments for management activities in addition to payments for results, as applied in the Burren programme and the Extensive Grassland Management programme in Baden-Württemberg, could be used as a means to reduce risks.

Conclusion

Agri-environment schemes are an important tool for achieving sustainable agriculture and are a major source of funding for nature conservation in Europe. The AES vary considerably from country to country in Europe. The objectives of these programmes and the choice of instruments usually reflect the characteristics of nature, the environmental and socio-economic problems associated with agriculture, and the political situation in each country. Understanding farmers' attitudes towards land use is a prerequisite for developing effective policies and programmes aimed at conserving and improving agricultural biodiversity. There is significant potential for expanding the implementation of results-based AES within the CAP. The examples of successful and long-term adoption of this type of schemes in different European countries provide a promising basis for their further application, as long as they are adapted to the local conditions and characteristics of farming systems; consider the economic risks for farmers and promote innovation. Payment-for-results schemes depend on setting clear targets linked to farming practices that can be measured by reliable indicators that are not directly dependent on external factors. Where this is not possible, a hybrid approach may be considered, complementing existing action-based schemes with result-based schemes. The integration of different approaches can help to improve the effectiveness of agri-environment schemes and achieve better outcomes for nature and farming communities.

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CONTRIBUTION OF EUROPEAN PROGRAMS TO DEVELOPMENT – COMPETITIVENESS – INNOVATION AND GENERALLY TO THE ECONOMY FOR THE REGION OF PELOPONNESE OVER THE LAST 20 YEARS IN THE FIELD OF MANUFACTURING

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Abstract
This research analyzes the contribution of European programs regarding the enhancement of innovation and competitiveness for manufacturing in the Peloponnese Region for the last 20 years. It touches on the relationship between NSRF programs and the funding provided to local manufacturing businesses, as well as the impact of changes on sustainability and development. Particular emphasis is placed on assessing how these programs contribute to improving production, promoting technological innovation and enhancing competitiveness at international level. The research focuses on strategies adopted by companies to utilize financial tools to modernize as well as the challenges they face in applying new technologies for sustainable development requirements. In this context, the role of the Structural Funds in reforming industrial production and their contribution to the long-term development of the region is examined. The results of the survey aim to continue the economic development of the Peloponnese Region and emphasize the need to enhance sustainability, growth and innovation, with the main objective of consolidating competitive dynamics in manufacturing industry.
The European Union plays a very important role in promoting regional development, competitiveness in the Member States, innovation and a number of strategic financing initiatives. Over the last 20 years, the Peloponnese region in Greece has benefited significantly from these programs, particularly in the manufacturing sector. This paper aims to examine the contribution of European programs to the economic transformation and development of the Peloponnese, focusing on the manufacturing industry of the region.
Key words: European programs, competitiveness
JEL: O1, R1

1. The Framework for European Integration and Regional Development

European integration has been recognized for many years as a mechanism for promoting economic cohesion, but also for reducing disparities between regions. The

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European Union's structural policies are carefully designed to support regions lagging behind in development, thus ensuring that all Member States can benefit from the social and economic advantages of their membership of this Union. These policies are mainly implemented through European, Structural and Investment Funds (ESIF), which include various financial instruments aimed at strengthening social, economic and territorial cohesion (European Commission, 2021).

1.1. Objectives and Structure of European Funding Programs

The aim of European funding programs is to promote economic growth by improving infrastructure and enhancing the competitiveness of small and medium-sized enterprises, as well as promoting innovation and sustainable development. These programs are structured in multiannual frameworks with very specific objectives and funding allocations for different periods. Among these frameworks are the so-called Community Support Frameworks (CSFs) for the National Strategic Reference Frameworks (NSRF), which provide a strategic direction and the financial resources necessary for regional development initiatives (European Commission, 2020).

It is a foundation for economic growth due to its significant contribution to GDP, employment and exports. In the context of the Peloponnese, manufacturing was decisive for economic growth, but also for job provision. However, this sector has faced many challenges over the years, such as economic recessions, pressures for globalization and the need for technological methods and advances. European programs have been crucial to address these challenges, providing the necessary financial support and promoting an environment conducive to competitiveness and innovation (Behun et al., 2018). The Peloponnese is a historically important and strategically located region in southern Greece, while it has unique economic and developmental characteristics. It is known for its agricultural production. The region has taken very important steps in diversifying its economic base. With manufacturing emerging as a key sector, the region's development strategy has been largely supported by European programs, where they have provided significant funding to improve innovative initiatives and infrastructure (Kyriakopoulos, 2023).

This paper examines the impact of European programs on the Peloponnese manufacturing sector over the last 2 decades. It analyses the contribution of these programs in terms of developing infrastructure to support SMEs, innovation and developing human capital with environmental sustainability. The analysis is based on data and case studies from different regional units of the Peloponnese, thus highlighting specific projects and their results.

2. Significance of the Study

Understanding the impact of European programs on regional development is very crucial for different reasons. Initially, it provides information on the effectiveness of the European Union's policies and financial mechanisms in achieving their objectives. Secondarily highlights best practices but also successful strategies, which can be applied to other regions and sectors. It also underlines the importance of continued support for regional development initiatives, especially for regions facing economic challenges.

3. European Programs and Structure

CSF and NSRF: For support and economic development in the regions, European and Investment Funds are key tools. They can provide the necessary financial support to strengthen infrastructure.

The role of the CSFs: The first CSF in 1989 – 1993 focused on improving infrastructure and led to the first steps towards economic cohesion. In 1994 – 1999, due to growth, tackling economic and social inequalities began. The third CSF in 2000 – 2006 saw major projects aimed at enhancing competitiveness, while the 4th NSRF, which covered the years 2007-1013 and 2014-2020, focused on innovation, sustainable development and integration into the European economy.

4. Impact on the Peloponnese

Studies

The funds given by the European Union to upgrade the region's infrastructure, such as transport networks, which are essential for the supply chain, as well as improved roads, which are of general utility. All these features greatly facilitated the site and reduced costs for developers. Small and medium-sized enterprises in the Peloponnese region (Fletcher et al., 2021) received very significant support through loans, but also grants, which aimed to enhance competitiveness through innovation, but also entrepreneurship. In 2007 – 2013, the Competitiveness Program had critically significant funding for projects related to modernization and expansion. A focus was placed on innovation, which led to many investments in research and development; Creation and innovation have encouraged collaboration between universities and industries and this has led to the creation of new products and processes that enhance the competitive advantage for the region. They were invested through training programs for the local workforce in skills needed to be applied in a modern production environment. The European Union has placed considerable emphasis on vocational training and education, while at the same time helping to reduce unemployment. To improve productivity (Behun et al., 2018). Programs aimed at improving environmental sustainability to support the uptake of green technologies in manufacturing contributed not only to reducing environmental impact, but also to positioning. Businesses in positions that comply with the strictest regulatory requirements of the European Union.

Regional Unit of Argolis
Under the Competitiveness **and Entrepreneurship Program 2007 – 2013,** 134 project proposals were submitted with a total budget of 159.7 million euros. Of these, 71 projects were approved, thus significantly enhancing local manufacturing capacities (Kyriakopoulos, 2023).
Regional Unit of Arcadia
Arcadia benefited from significant support from the European Union with the submission of 193 proposals to the same program, but focusing on upgrading infrastructure and industry. This had strengthened the region's economic resilience and growth prospects.
Regional Unit of Corinthia:
Corinthia has achieved the highest absorption rate of European Union funds among the Peloponnese regions with 391% in some programs, showing effective utilization of available resources for economic development.
Regional Unit of Laconia:
Manufacturing in distress has seen significant cases particularly in terms of project completion, with 85 projects successfully completed under the Regional Operational Program for SMEs (PwC Greece, 2022).
Messinia focuses on innovation and modernization, with the support of the European Union, implementing numerous projects aimed at improving competitiveness and expanding the market.

4.1. Regional Impact Analysis

The funds disbursed by the European Union led to an unprecedented economic growth for the Peloponnese region, new businesses were established, while existing ones were expanded and have created many new jobs, thus significantly reducing unemployment rates and strengthening local economies (European Commission, 2021). The European Union, following targeted investments, has enabled manufacturers to enhance competitiveness that they had through advanced technologies, modernizing their activities and managing to improve the quality of their products. They expanded their market domestically and internationally and increased production efficiency. The programs support research and development activities to lead to the creation of new products and services. This innovation strengthened the manufacturing sector, but also contributed to the region's overall economic resilience (Xie, Jiang, & Han, 2020). Complementary, the programs has important social ones. And environmental benefits. Green technologies and sustainable practices significantly reduce the environmental footprint in the manufacturing sector. The emphasis on human resource development improves skills in a local workforce. And it leads them to better employment prospects with higher living standards (Li, Li, & Ren, 2018).

5. Detailed Contribution of Programs

1. **Competitiveness and Entrepreneurship Program (2007 – 2013):** This program aimed to enhance the competitiveness of Greek SMEs through investments in innovation, internationalization and modernization. The success of the program in the Peloponnese is evident through the large number of approved projects, but also through the substantial financial support provided (Jarsulic, 2021).
2. **Competitiveness, Entrepreneurship and Innovation Program (2014 – 2020):** Building on the success of the previous program, this program continued to support SMEs in the Peloponnese, providing significant funding for innovation and technological progress. This program emphasized the importance of environmental sustainability but also energy efficiency, which was aligned with the wider objectives of the European Union (Povolná & Švarcová, 2017).
3. **Research – Creation – Innovation Program:** This initiative has been crucial in promoting collaboration between academics and industry. By supporting research projects and innovative ventures, the program facilitated the development of new technologies and products, thus enhancing the competitive advantage of the region.

5.1. Future Prospects

The ongoing programs of the European Union for the period 2021 – 2027, continue to build on previous successes with new initiatives, which adapt to the evolving needs of the manufacturing sector. The aim of the modern manufacturing program is to enhance the competitiveness of existing manufacturing SMEs and support the establishment of new ones, with a particular focus on innovation and market internationalization with a focus on promoting sustainable business practices. This program supports projects related to waste management, energy efficiency and the development of green products. Energy efficiency for SMEs aims to improve the energy efficiency of manufacturing processes, helping SMEs reduce costs and comply with European Union energy standards (Rutledge & Mayorga, 2022).

Conclusions

European programs play a critical role in transforming the manufacturing sector in the Peloponnese region, provide financial support and promote a culture of innovation and sustainability, where these programs have enabled significant economic growth. The region continues to leverage funding from the European Union and is well positioned to achieve further growth and competitive advantage in the global market (Fletcher, McNamara, & Wyatt, 2021). The lessons learned and the successes achieved in the Peloponnese can serve as a model for other regions wishing to reap the benefits offered by the European Union through integration and support. It focuses on innovation, sustainability and competitiveness, while it can continue to thrive and contribute significantly to Greece's economic growth. Future programs should continue to address the specific needs of the region, while ensuring that the manufacturing sector remains a key driver of economic growth (Behun et al., 2018). In conclusion, the European Union's commitment to regional development through various funding programs has a profound impact on the Peloponnese, the region's ability to innovate and adapt is the answer to global challenges, which has been significantly strengthened by these programs, placing it in continuous success in the coming years. As Bulgaria prepares to receive similar support. The experience of the Peloponnese can provide valuable knowledge and best practices to maximize the benefits of European Union funding (European Commission, 2021).

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EXPLORING THEORETICAL AND METHODOLOGICAL APPROACHES FOR ANALYZING STRUCTURAL CHANGES IN AGRICULTURE: A FOCUS ON BULGARIA

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Abstract

This paper presents a comprehensive framework for analyzing structural changes in Bulgaria's agricultural sector, focusing on the period following the country's accession to the European Union (EU). The integration into the EU has brought major transformation in the country, especially in the agricultural sector, as the country implemented the Common Agricultural Policy (CAP) and adapted its regulatory and economic governance. The framework developed in this study is based on an extensive literature review and uses analysis and synthesis as the main scientific methods to explore the multifaceted evolution of the sector. The study presents an initial assessment of the current changes and identifies key drivers utilizing statistical and comparative analysis. The index, structural and correlation assessments revealed key trends including a decline in the number of agricultural holdings and a simultaneous increase in the average size of farms. These structural changes indicate a process of land consolidation and resulted in a dualistic structure, driven by the market forces and policy incentives. Furthermore, there have been significant shifts in production specialization, including increased specialization in certain crop types and a decline in livestock production which led to imbalanced crop and animal output, mainly due to the direct payments. These shifts are accompanied by ongoing challenges in competitiveness, particularly in smaller farms that struggle to integrate into the market, and financial support distribution remains uneven. Moreover, the lack of young skilled workers led to demographic changes and declined agricultural employment. Thus, important key drivers and their effect on the productivity, size of the farms, and the economic development are identified. The analysis conducted in this study offers valuable insights and a comprehensive understanding of these complex and multifaceted changes. It is suitable to support the foundation for informed policy-making and strategic planning and signify the importance of targeted policies directed at ensuring fair distribution of financial support, enhancing competitiveness, and addressing inequalities to achieve balanced economic development.

Key words: Structural Changes, Specialization Pattern, EU Accession, Agricultural Policy
JEL: Q10, Q15

Introduction

Agriculture has historically been a cornerstone of economic and social development worldwide. Over the past decades, the sector has undergone significant structural changes driven by technological and technical progress, governmental and policy reforms, and market, and environmental concerns. In Eastern Europe, the shift from centrally planned to market-oriented economies after 1989 has introduced further complexity to these changes. Bulgaria, in particular, underwent specific development patterns during these transformative periods. The agricultural sector has faced

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incremental structural changes since the fall of communism, accelerated after the country's accession to the EU in 2007. Upon joining the European Union (EU), the implementation of the Common Agricultural Policy (CAP) introduced a new regulatory framework, and financial support targeted the effectiveness of the sector's development. It resulted in the emergence and development of new structures of farming enterprises as the transformation continues with specific adjustments of these structural changes. Therefore, many researchers have studied these developments and specific aspects of the transitions. However, the structural changes are a continuous complex process, which requires capturing their multifaceted nature constantly.
This paper aims to present theoretical and methodological approaches for analyzing structural changes in agriculture, with emphasis on current developments in Bulgaria. It is built on a literature survey, with analysis and synthesis as scientific procedures. The paper also provides a preliminary assessment of current trends and highlights drivers through statistical and comparative analysis. In the following sections, an integrated review of literature, theoretical and methodological approaches relevant to this study is introduced first. Next, the chosen methods and the analysis of the obtained results are presented. Finally, a summary of the findings and conclusions are provided.

Literature Review

Structural changes in agriculture

Structural changes in agriculture involve shifts at different levels, namely micro, meso, and macro, and have an impact on farm sizes, productivity, and economic development (Van Neuss, 2019; Mann, 2021; Deininger et al., 2022a). These developments are shaped by multiple factors and driving forces including technology, government policies, and societal perspective (Jurkėnaitė, 2021; Tyapkina et al., 2021; Grabowski & Self, 2022). One of the key changes relates to the use of labor-saving technology, which leads to the reduction of labor in agriculture, affecting both rural and urban areas. Simultaneously, this contributes to overall productivity growth and structural transformation (Porzio et al., 2022; Grabowski & Self, 2022; Eckert & Peters, 2022). In addition, governmental support can result in the agricultural sector changes, impacting the balance between farms. Furthermore, it can stimulate investments, enhance productivity, and improve marketing efficiency in the agricultural sector. (Tyapkina et al., 2021; Cervantes-Godoy, 2022). Understanding these processes is essential for achieving sustainable agricultural development and economic growth, highlighting the interdependence of various levels within the agricultural system.
In this regard, many studies have been done in the European Union (EU) to examine the evolving structure of agriculture, focusing on various regions. These studies have examined the evolving role of agriculture in the economy, changes in farm

sizes, the impact of natural conditions, agricultural prices, subsidies, and macroeconomic factors on farm structures, and the prolonged effects of financial and economic crises on European farms. (Martinho, 2019; Bożek et al., 2020; Jurkėnaitė, 2021) Comparable studies have been conducted in Bulgaria in recent decades due to significant changes in the agricultural sector, as already mentioned primarily driven by the country's transition to a market-based economy and its accession to the EU (Van Herck & Swinnen, 2015; Kostadinova, 2017; Atanasov et al., 2023). The continuous transformation of Bulgarian agriculture is characterized by the overall shift towards sustainability, mechanization, digitization, and multifunctionality (Doitchinova et al., 2019).

Theoretical Frameworks

The theory of structural changes in agriculture is a diverse and complex topic that has been extensively studied in academia. The existing research highlights many factors that contribute to the ongoing transformations within the sector, both in developed and developing economies. The process of structural transformation in agriculture, characterized by the movement of labor from agriculture to non-agricultural sectors and the associated increase in farm size, has been a central theme in the economic development literature, including the role of wage gaps, policy-induced barriers, trade costs, and technical change (Deininger & Ma, 2022b).

Next, the theoretical framework used to analyze structural changes in agriculture is the structure-conduct-performance model from industrial organization economics (Gali et al., 2000). However, Gali et al. (2000) noted that this model is limited in its ability to capture the rapid changes caused by technological advancements, consumer preferences, etc., and proposed an alternative analytical framework that explores the wider range of internal and external factors, including institutional, societal, technological, economic, human capital, and financial drivers of change.

Other studies explain how technology and economies of scale influence agricultural structures. Neuenfeldt et al. (2019) and MacDonald & McBride (2009) discuss how both have led to increased farm size and concentration of output in larger, more specialized units, particularly in the livestock industry. Several other studies have emphasized the importance of the specialized nature of farms when examining structural change. Evenson & Huffman (1997) first proposed a framework that explores how input prices, public and private research, public extension, and government programs can, directly and indirectly, influence changes in farm size, farm specialization, and part-time farming, thereby affecting total factor productivity.

Furthermore, the impact of government policies on farm structure has been intensively studied, with a focus on how interventions affect farm consolidation, the adoption of new technologies, and the overall structure of the agricultural sector

(Pagel et al., 2002; Huettel & Jongeneel, 2011). In the literature has also been explored the implications of structural changes in agriculture for rural communities, the environment, and overall economic development (Andersson, 2005).
The theory of structural changes in agriculture encompasses a diverse range of factors, including technological advancements, economies of scale, policy interventions, and socio-economic dynamics considered in the current study.

Methodological Approaches

The academic literature has also explored various methodologies for analyzing and studying the structural changes occurring in the agricultural sector. The methods and techniques aim to capture the complex and multifaceted nature of the adjustments taking place in farm size, specialization, productivity, and the overall structure of the agriculture. Some of the main approaches used in different research include taxonomy, generalization methods, comparative analysis, etc. (Jurkėnaitė, 2021). Mathematical statistical methods, such as estimating the arithmetic weighted average and using the Pearson criterion, along with qualitative analysis, are used to evaluate the importance and suitability of changes in organizational structures (Kleiber, 2018). Furthermore, in the context of statistical tests, structural change tests play a crucial role in assessing parameter invariance, with the empirical fluctuation process and permutation approaches are advanced techniques to standard approximations for obtaining the sampling distribution, enhancing the test's power and validity (Kleiber, 2018). The latter group of methods includes time series analysis widely used in various economic studies, which is employed in current analysis for assessment of the current changes and key drivers of structural changes in the agricultural sector in Bulgaria.

Research Process and Findings

Materials and Methods

Analyzing structural changes in agriculture in Bulgaria involves understanding shifts in various aspects of the agricultural sector. Therefore, this paper uses the following data sets: farm number (at the national), average farm size (national level), production specialization (crop output and livestock output), and agricultural employment (employed workforce). The conducted analysis uses standardized data from the National Statistical Institute and the Ministry of Agriculture and Food, enabling us to examine Bulgaria's agricultural sector in a wider context and identify key trends in comparison to the EU. The research makes use of a wide range of reports, studies, and publications from Bulgarian academia, along with government and policy documents, to facilitate the discussion and deep understanding of specific issues. The current analysis covers the period from 2010 to the last available data sets. The timeframe is important for assessing the changes induced by EU membership and proposing data-driven decisions for the future.

The essential tools used to understand the complex changes occurring in Bulgaria's agricultural sector are indexed, structural, and correlation analysis. The indexed analysis offers a broad overview of the trends using indices, allowing for tracking changes over time and measuring agricultural development simultaneously. This approach also provides assessments for comparative analysis of different time periods and production sub-sectors. Structural analysis provides detailed insights into the production composition and organization of the agricultural sector, while correlation analysis uncovers the relationships between the mentioned key variables of production and employment. To examine the strength and direction of the relationship between these variables, the most common metric of Pearson correlation coefficient[1], which ranges between –1 (indicates a perfect negative relationship) and +1 (indicates a perfect positive relationship).

Results and Discussion

Since joining the EU, Bulgaria has adopted the CAP framework, leading to significant changes in the agricultural sector. One notable development is the trend toward land consolidation. Previously, Bulgarian agriculture was characterized by numerous small farms, as evident in Figure 1, with an average size of 1.1 hectares (relevant to the data available for 2010). According to Kostadinova (2017), the agricultural sector has seen a decline in the number of farms, but a rise in the average size of farms. This has resulted in a dualistic structure, with a few large farms that specialize in specific areas, and many small farms that focus on subsistence farming. Pressures from the EU market and the availability of subsidies favoring more intensive operations have prompted some small farmers to sell or lease their land to larger agricultural enterprises.

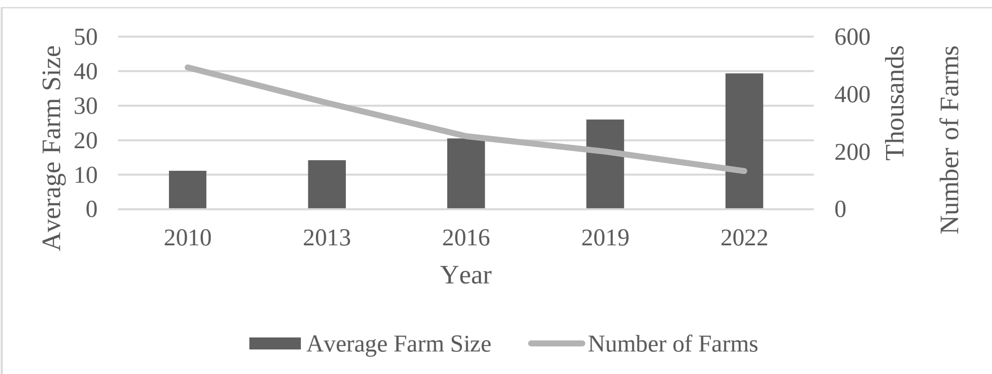

Figure. 1. Average Farm Size, Number of Farms by Year

Source: National Statistical Institute

[1] Microsoft Excel was utilized for all data calculations, analysis, and visualization.

Scientists from the Institute for Economic Research at the Bulgarian Academy of Sciences argue that the allocation and management of financial resources within the agricultural sector have also led to structural issues and inefficiencies. These include the concentration of land and capital, the formation of monopolies in leasing farmland, and declining livestock, among others (as cited in Rangelova & Vladimirova, 2017) This has resulted in a decrease in the number of small farms and an increase in the average farm size up to 4 ha (Figure 1). Consequently, farmers who have accessed the necessary resources have been able to enhance their businesses through CAP subsidies and financial assistance mechanisms.
It is important to consider the consistent decline in the number of farms and the increasing pace of this decline. The index analysis, using the chain index technique, highlights the more pronounced changes in the number of farms during the transition from one programming period to the next, specifically in 2013 and 2020 (Figure 2) for the current analysis. These periods typically involve adjustments and significant revisions of policies, as well as indicating other unusual events, such as economic shocks and major market movements.

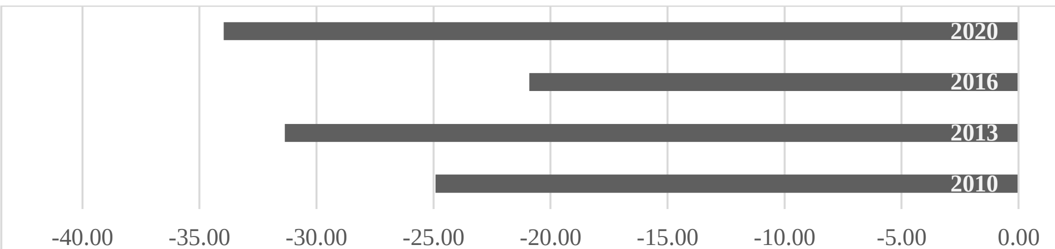

Figure 2. Index analysis of number of farms, 2010 – 2020, %

Source: own calculations

Technological modernization has played a significant role in the structural development of Bulgarian agriculture. Access to EU funds for agriculture and rural development has enabled farmers to invest in machinery and advanced technologies, increasing production and efficiency. This shift has also changed agricultural production patterns, with a greater emphasis on high-value commodities from the crop sector such as cereals and oilseeds. Usually, the crops often yield higher profits in the EU market. Direct payment is heavily concentrated on crop production rather than livestock, and limited support for livestock farms (Bachev, H, 2011). Beluhova-Uzunova, R., Hristov, K., & Shishkova, M. (2018) stated that the increased production of cereals and industrial crops is mainly related to the direct payments that are beneficial to extensive crop producers. Resulting in rapidly increasing crop production output and gradually decreasing livestock, leading to an unfavorable effect on the agricultural sector of Bulgaria (Figure 3). These developments contribute to the decrease in animal output due to the shift of farmers' focus to arable crops, leading to a decrease in animal population along with other challenges.

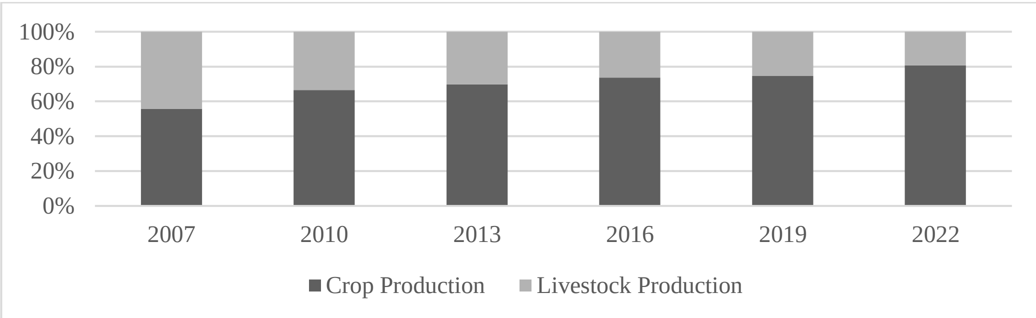

Figure. 3. Crop Production and Livestock Production by Year

Source: National Statistical Institute

The next significant indicator of structural transformation is the share of GVA from agriculture in Bulgaria's national GVA. The clear trend of its decline (see Figure 4) since the accession to the EU reflects overall economic trends, including intensification, industrialization, and the increasing dominance of the services sector. However, it remains high compared with those in other EU-28 countries where in most cases is already under 3% (Rangelova, R., & Vladimirova, K., 2017). The country's economy has experienced substantial growth in industry and services, which have expanded, attracted investments, and generated employment. These processes have also led people away from agricultural jobs, further challenging sustainable agricultural development. Simultaneously, farmland consolidation and CAP funds utilization have increased efficiencies and competitiveness, but they have also exacerbated inequalities, and smaller farms have fewer opportunities to develop and provide viable businesses for local communities, which further contributed to the demographic challenges facing Bulgarian agriculture. The demographic changes in rural areas, including aging populations and outmigration, have also weakened the agricultural sector.

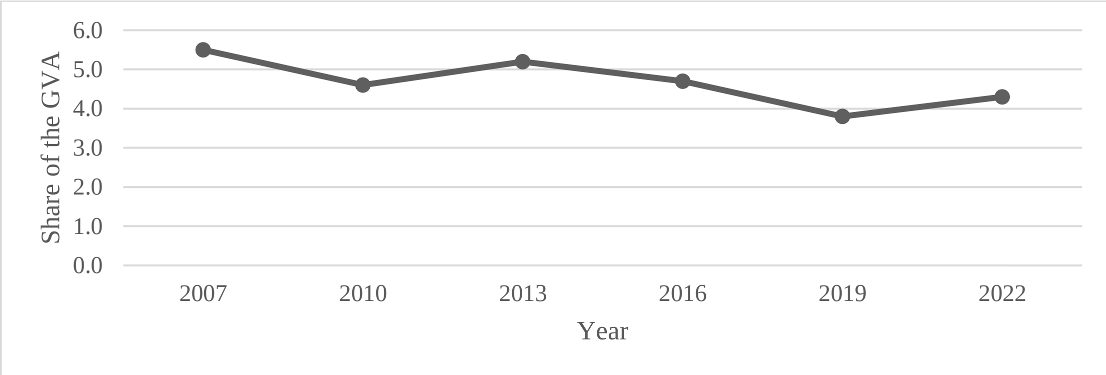

Figure. 4. Share of the GVA

Source: National Statistical Institute

Thus, another notable change in Bulgarian agriculture after EU accession has been the steady decline in agricultural employment seen in Figure 5. According to the existing studies, highly degraded educational and age structure is related to a lack of young and skilled workers in the agricultural sector (Beluhova-Uzunova, R., Hristov, K., & Shishkova, M.,2018).

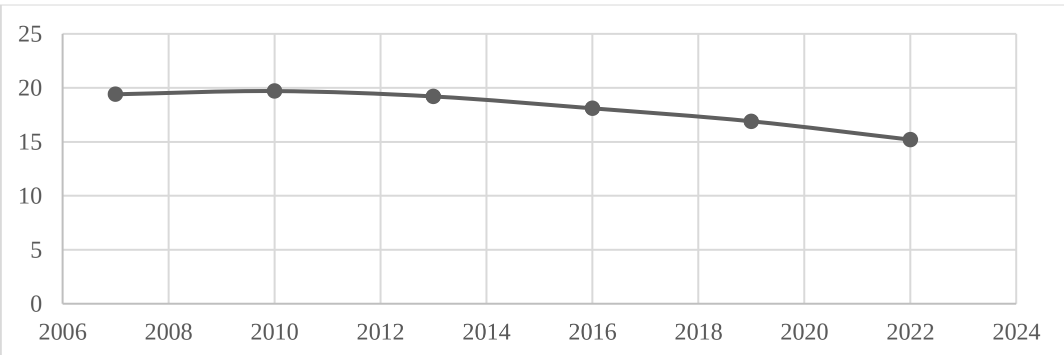

Figure. 5. Share of the Agricultural sector Employment

Source: National Statistical Institute

As mentioned in the official ministry's report, 24% of permanently employed agricultural workers were aged 65 and over, and 11% were under 35 years of age (Ministry of Agriculture and Food, 2022). The correlation analysis revealed a strong negative (correlation coefficient = –0.84) relationship between employment and agricultural output. This strong interrelation reflects the fact that increased productivity resulted from modernization and shifts in agricultural work (intensified production typically requires fewer, but more skilled workers). Our correlation analysis shows also that the GVA and employment in the sector have a positive strong relation (correlation coefficient = 0.69), therefore, it proves that the reduction of the younger workers has a negative effect on both the GVA and the share of the agricultural employment.

Conclusion

Since the country became a member of the EU, Bulgarian agriculture has undergone a significant transformation in its organization and operations. This transformation has been primarily driven by the introduction of new policies, the adoption of advanced technologies, and the impact of market dynamics. The outcomes of these changes include notable improvements in productivity and the modernization of agricultural practices. However, these developments have also given rise to challenges. These challenges encompass the need to ensure sustainable agricultural practices, address inequalities within the agricultural sector, and navigate evolving labor demographics. Achieving balanced and sustainable economic development requires addressing these challenges through targeted policies that bolster both the ongoing progress of agriculture and the overall economic growth of the country.

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AI (Grammarly) was used to correct grammar, spelling, and punctuation and shorten sentences.

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