AN OVERVIEW ASSESSING OF THE EUROPEAN UNION AGRICULTURAL SECTORIAL DYNAMICS: A DRAFT ANALYSIS FROM THE ROMANIAN PERSPECTIVE

Jean Vasile Andrei[1], Violeta Sima[2], Ileana Georgiana Gheorghe[3]

**Corresponding author E-mail: andrei_jeanvasile@yahoo.com*

ARTICLE INFO

Review Article

Received: *06 November 2023*

Accepted: *12 December 2023*

doi:10.59267/ekoPolj23041235V

UDC 338.439(4-672EU)(498)

Keywords:

agriculture, agricultural income, farm specializations, reform, intermediate

***JEL**: Q15, Q24, R14*

ABSTRACT

The evolution of European agriculture is a result of the numerous paradigm transformations and reforms occurring during the time. The intensification and specialization of the agricultural sector have determined a set of challenges and changes which has imposed a dramatic shift from the traditional European agricultural model. The main aim of this paper is to assess and evaluate in a draft manner the European Union`s agricultural sectorial dynamics from the Romanian perspective. In order to identify main trends and gaps in the European agricultural sector and argue the aims and scope of the research some of representative indexes were analyzed and presented in the specific context: nominal. Using the descriptive analysis of indexes such as: value, price, and volume of the agricultural production, farm specializations, agricultural income per annual work unit (Indicator A) and key components, agricultural output, and intermediate consumption, this current research provides an insight introduction to the agricultural sector of the European Union (EU). The main analysis results could serve as inputs for policymakers in drafting the agricultural guidelines in terms of functionality and application in understanding the sectorial evolutions.

1 Jean Vasile Andrei, Ph.D., Full Professor, Petroleum-Gas University of Ploiesti, 39, B-dul Bucuresti, Ploiesti, 100680, and Researcher, National Institute for Economic Research 'Costin C. Kiritescu', Romanian Academy, Romania, Phone: +40727615540, E-mail: andrei_jeanvasile@yahoo.com, ORCID ID (https://orcid.org/0000-0002-8332-6537)

2 Violeta Sima , Ph.D., Associate Professor, Petroleum-Gas University of Ploiesti, 39, B-dul Bucuresti, Ploiesti, 100680, E-mail: violeta.sima@gmail.com, ORCID ID (https://orcid.org/0000-0001-5958-8222

3 Ileana Georgiana Gheorghe, Ph.D., Asassociate Professor, Petroleum-Gas University of Ploiesti, 39, B-dul Bucuresti, Ploiesti, 100680, E-mail: ileghe2016@gmail.com, ORCID ID (https://orcid.org/0000-0002-5220-9864)

Introduction

The position of agriculture in today's economic landscape has changed dramatically in recent times. Originally a cornerstone of employment and a major contributor to Gross Domestic Product (GDP), it has now adapted to embrace technology and contribute to international trade. While its direct share of GDP may vary from region to region, the importance of agriculture in driving economic growth, ensuring food security, and promoting environmental sustainability remains unchallenged. It is an indispensable sector of modern economies. With the world's population surging at an unprecedented rate and with a European Union age gap advancing, the need to increase agricultural production and efficiency has become a critical issue in both current and future debates about the role and place of agriculture in the actual contemporary economy.

The continuous reforms of the Common Agricultural Policy (CAP) and the ongoing challenges posed by climate change have led to an increased heterogeneity within European agriculture. In their study, (Giannakis et. al.(2015) investigated the varied agricultural performance across the EU-27, seeking to understand the underlying drivers of these differences. Mastronardi et.al.(2015) presented insightful findings from their research on the environmental impact of Italian farms engaged in agri-tourism versus those not involved in such activities. This study highlighted the unique environmental footprints of these two types of farms, providing a nuanced view of agriculture's intersection with tourism.

Rybaczewska-Błażejowska et. al. (2018) evaluate the eco-efficiency performance of agriculture in the sector by integrating life cycle assessment (LCA) and data envelopment analysis (DEA) methods to assess the eco-efficiency of the agricultural sector at a broader level. Their study encompassed the agricultural output of all 28 EU member states, offering a detailed landscape of the sector's environmental performance. Crecana and Crecana,(2019) have focused on identifying innovative strategies to enhance the efficiency of Romanian agricultural farms amidst broader economic growth. This research aimed at providing actionable insights for improving farm performances in the context of Romania's evolving economy. Pishgar-Komleh et. al. (2021) in their study utilized a Window Slack-Based Measurement Data Envelopment Analysis (W-SBM-DEA) model, factoring in undesirable outputs, to assess the agricultural performance of the EU-27 from 2008 to 2017. Their analysis revealed notable stability in the European agricultural sector, with countries like the Netherlands, Italy, and Malta exhibiting particularly consistent performance.

Rađenović et. al. (2022), categorized EU countries based on the progression in their agricultural economic performance. Through a cluster analysis approach, they investigated various key indicators, such as the aggregate input of the labor force, the annual real income of agricultural factors per work unit, the overall output of agriculture, the gross added value in the agricultural sector, and the production from livestock. This study spanned two distinct periods, 2015–2017 and 2018–2020, offering a dynamic view of the economic trends in the EU's agricultural sector.

As the agricultural sector's relative significance declines in relative terms, other industries like manufacturing, services, and technology are rising to fill the economic void. These sectors are expanding rapidly, compensating for agriculture's reduced contribution, and reshaping the economic landscape. This emphasis underlines the urgent need to address agricultural sector development and sustainability challenges. Consequently, scholars and policymakers aim to implement innovative and sustainable practices in agriculture, with a growing interest in doing so. These approaches aim to meet the urgent needs of a constantly expanding world population while ensuring the preservation of long-term environmental and economic stability.

As Amuda (2022) argues agriculture is an essential element in achieving economic development and recognizing its importance, countries formulate and implement agricultural strategies aimed at stimulating agricultural production and, thereby, raising the standard of living of those involved in agriculture.

The CAP milestones have reflected a continuous evolution from a focus on production and price support to a more holistic approach encompassing environmental sustainability, climate change mitigation, and social equity. The CAP delivers a policy framework for today's agriculture that not only supports the economic viability of farming but also addresses the pressing challenges of sustainability, climate change, and rural development. The forthcoming direction of the CAP is expected to maintain equilibrium among varied requirements, adapting to new challenges and opportunities in the agricultural sector.

Although agriculture is an essential part of Romania's economy, making a significant contribution to its GDP and providing job opportunities, there is a strong need to restructure and increase the productivity of the sector. However, as previously discussed in numerous studies in the literature (Reidsma et al., 2007; Andrei et al., 2020; Eder et al., 2021; Dias et al., 2021; Ait Sidhoum et al., 2023; Bertoni et al., 2023), the economic feasibility for farmers remains a concern due to challenges such as small land holdings, accessing markets and pricing mechanisms.

Popescu et. al.(2019) assess the impact of fixed capital, energy use, and domestic material consumption are reshaping Romania's internal economic model, by applying an intensive version of the Cobb-Douglas function to analyze these effects from an economic standpoint. The findings highlight key factors at both the Romanian and EU-28 levels that are pivotal in forming effective economic policies. Notably, the study points out that Romanian agriculture, while accounting for about 30% of Europe's farms, contributes just 3% to the EU's total agricultural output. In related research (Florea et. al., 2019) explored farmers' motivations for joining or leaving agricultural associations in Southeast Romania, suggesting ways to enhance the sustainability of these cooperative models.

Han, (2016) emphasized the need for a thorough post-analysis in agricultural sector trade negotiations. This approach aims to refine agricultural policies by balancing the interests of both agricultural and non-agricultural sectors more impartially. Borodina et.

al. (2018), discussed the exclusion of agricultural lands from local and rural development. It was observed that the dominance of large-scale land contracts and changes in land use patterns are undermining the sustainability of agriculture and rural communities.

Andrei and Dragoi (2019) analyzed in-depth the progression of the agricultural sector among several EU-28 states from 2006 to 2015, analyzing a wide range of data that included vegetal and animal production, labor force, and gross value added in the agri-food sector. (Himics et. al., 2019; Pantović et al., 2023) employed a partial equilibrium model (CAPRI) to assess the impact of hypothetical greenhouse gas reduction subsidies on the EU farming sector and global food markets.

Garske et. al.(2021) investigated the environmental potential and challenges of digitalization in agriculture, providing an assessment of relevant EU legal frameworks for digital technology in agriculture. Pishgar-Komleh et. al. (2021) used a Window Slack-Based Measurement Data Envelopment Analysis (W-SBM-DEA) model to measure the EU-27 agricultural sector's performance, with a focus on eco-efficiency and comparison between older and newer EU member states. Lastly, Jarosz-Angowska et. al.(2022) evaluated how European integration has influenced the agricultural competitiveness of countries that joined the EU post-2004, revealing both improvements and disparities in the agricultural trade competitiveness of these countries.

The agricultural sector is multi-dimensional, reflecting its complex and integral role in global economies and societies. Understanding and improving this performance requires a balanced approach that considers economic efficiency, environmental sustainability, technological advancement, and social impact. Investigating the agricultural sector's efficiency within the European Union (EU) can be evaluated using a range of indicators, including agricultural output, agricultural income, agricultural prices, and resource performance as already have been carried on in numerous studies as (Andrei & Dragoi, 2019; Guth, & Smędzik-Ambroży, 2020; Choiet al., 2021; Stoian et al., 2022; Nilsson et al., 2022, Constantin et al., 2021)**.**

The main aim and scope of the research was to draft an analytical assessment, providing a comprehensive overview of the evolutionary trends and significant transformations within the agricultural sector of the European Union, all viewed through the specific lens of Romania's experiences and developments. he research aligns with other studies such as: (Anghelache, (2018), Andrei et al., 2020; Constantin et al., 2021; Denisa et al., 2022 and Borda et al., 2023) and extends the investigations by narrowing the perceptive through the country approach. Through a focused, country-centric approach, this research highlights some of the unique aspects of Romania's agricultural dynamics, taking into account contemporary challenges within the broader EU framework. The intention is not only to map the trajectory of Romania's agricultural sector post-EU integration but also to identify and analyze some of the specific factors that have shaped its current state. This in-depth examination aims to present nuances and specificities of Romanian agriculture and to provide insights that could contribute to a more tailored and effective policy-making process within the EU, specifically addressing the needs and characteristics of individual member states.

Data and methodology

In order to achieve the main aims and scope of the research and writing a draft analysis in overview assessment of the European Union agricultural sectorial dynamics from the Romanian perspective were considered and analyzed representative index such as: developments in the output of the agricultural industry and farm specialization, work performance in the agricultural sector and agricultural output and intermediate consumption.

The data sets were extracted from the Eurostat database, specifically from the sections on Statistics Explained on agriculture (Eurostat, 2023c) and 'Agricultural Statistics,' (Eurostat, 2023a, Eurostat, 2023b) including the explanatory notes dedicated to agriculture.

In order to achieve the main aim and scope of the research several indicators were considered and employed in the study, as they are described in table 1. The indicators considered are considered as defined in Eurostat methodology. The indicators and approach of such a study have been carefully planned to ensure that the choice of indicators, data sources, time frame, and methodology are all in line with the research objectives and provide a comprehensive and reliable analysis of the EU agricultural sector from the Romanian perspective. Table 1 presents the main indicators employed in the study, time-period availability of the data, availability source, and the web link where the datasets are available.

Table 1. Main data description

Description of the data	Time-period availability of the data	Availability source	Link
Output of the agricultural industry (volume, nominal price, nominal value)	2007-2022	Economic accounts for agriculture - indices: volume, price, values	https://ec.europa.eu/eurostat/databrowser/view/AACT_EAA05/default/table?lang=en&category=agr.aact.aact_eaa
Farm specializations: crop, livestock, and mixed farming	2005-2020	Agri-environmental indicator – specialization	https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicator_-_specialisation#Assessment
Agricultural income per annual work unit (Indicator A)	2007-2022	Economic accounts for agriculture - agricultural income	https://ec.europa.eu/eurostat/databrowser/view/aact_eaa06/default/table?lang=en
Factor income	2007-2022	Economic accounts for agriculture - agricultural income	https://ec.europa.eu/eurostat/databrowser/product/page/sdg_02_20
Total annual work unit (AWU)	2007-2022	Agricultural labour input statistics: indices	https://ec.europa.eu/eurostat/databrowser/view/aact_ali02/default/table?lang=en
indices agricultural output	2007-2022	Economic accounts for agriculture - indices: volume, price, values	https://ec.europa.eu/eurostat/databrowser/view/aact_eaa05/default/table?lang=en

Description of the data	Time-period availability of the data	Availability source	Link
Indices agricultural intermediate consumption	2007-2022	Economic accounts for agriculture - indices: volume, price, values	https://ec.europa.eu/eurostat/databrowser/view/aact_eaa05/default/table?lang=en

Source: the authors based on the Eurostat database survey

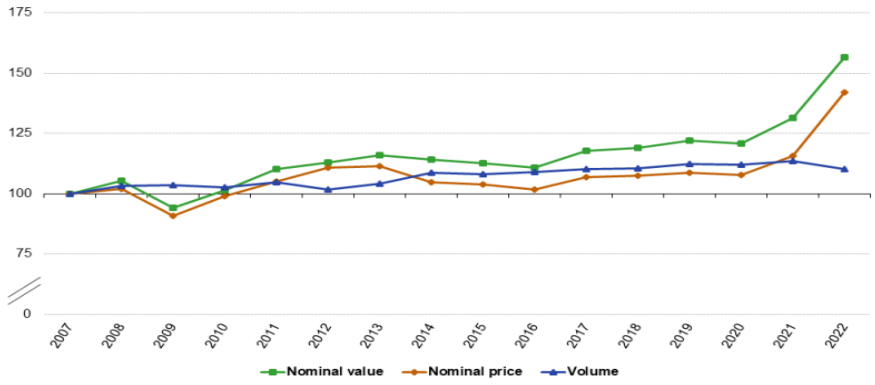
As the study aims to draft an overview assessment of the EU agricultural sectorial dynamics from a member state perspective, descriptive analysis was applied. This approach allows for the identification of some of the fundamental characteristics of the agricultural sector across different EU member states. As for methodology, it was focused on descriptive analysis with an emphasis on data augmentation to identify trends, limitations, and future developments in the context of the EU agricultural sector. The study extends and provides valuable information on trends, constraints, and future directions to design policy and strategic decisions through a combination of descriptive analysis and data augmentation.

Results and Discussions

Developments in the output of the agricultural industry and farm specialization

Figure 1 presents an overview of the agricultural production trends in the European Union over a period of fifteen years, revealing a significant rise in both nominal value and price indices in the latter part of the period, especially after 2020. The steady volume index during this period indicates that the aforementioned value gains are a result of price increases and not an upsurge in agricultural commodity production quantities. The indices indicate either steady conditions or moderate growth as of the beginning of 2020. Subsequently, a notable upsurge in both nominal value and price is observable, possibly implying the impacts of factors like the COVID-19 pandemic, modifications in agricultural policies within the EU, inflationary dynamics, or other noteworthy economic changes.

Figure 1. Developments in the output of the agricultural industry, (2007 = 100, basic prices, EU, 2007-2022)



Source: Eurostat (online data code: aact_eaa05)

The nominal value trajectory reveals minor oscillations but predominantly exhibits an upward trend. The initial phase was characterized by stability until around 2014, which was followed by a slight decline, a plateau, and impressive growth from 2021 onwards. This trend mirrors the nominal value of the agricultural sector's output. The period between 2007 and 2014 exhibited minor fluctuations that were close to the base 100 index, proposing a steady value when considering inflation.

The nominal price index exhibits fluctuations, experiencing a slight rise until approximately 2015 followed by a descent and plateau until a sudden increase in 2022. The significant increase observed in the latest recorded year may indicate a rise in agricultural output prices, an increase in output volume, or a combination of both, influenced by factors such as market demands, production costs, inflation trends, or legislative reforms affecting the agriculture sector. The agricultural output volume index is notable for its relative stability and minimal deviations around the base index value, avoiding any significant long-term increases or decreases until a noticeable upswing in 2021.

The disparity between the nominal value and output volume in the latter years of the graph indicates that the rise in nominal value is chiefly driven by price inflation rather than a substantive growth in the amount of agricultural commodities produced. The noticeable increase in both nominal value and price in recent years can be attributed to a combination of factors, including inflationary pressures, changes in supply and demand dynamics, policy adjustments, and external influences such as climate shifts or changes in the global economic environment.

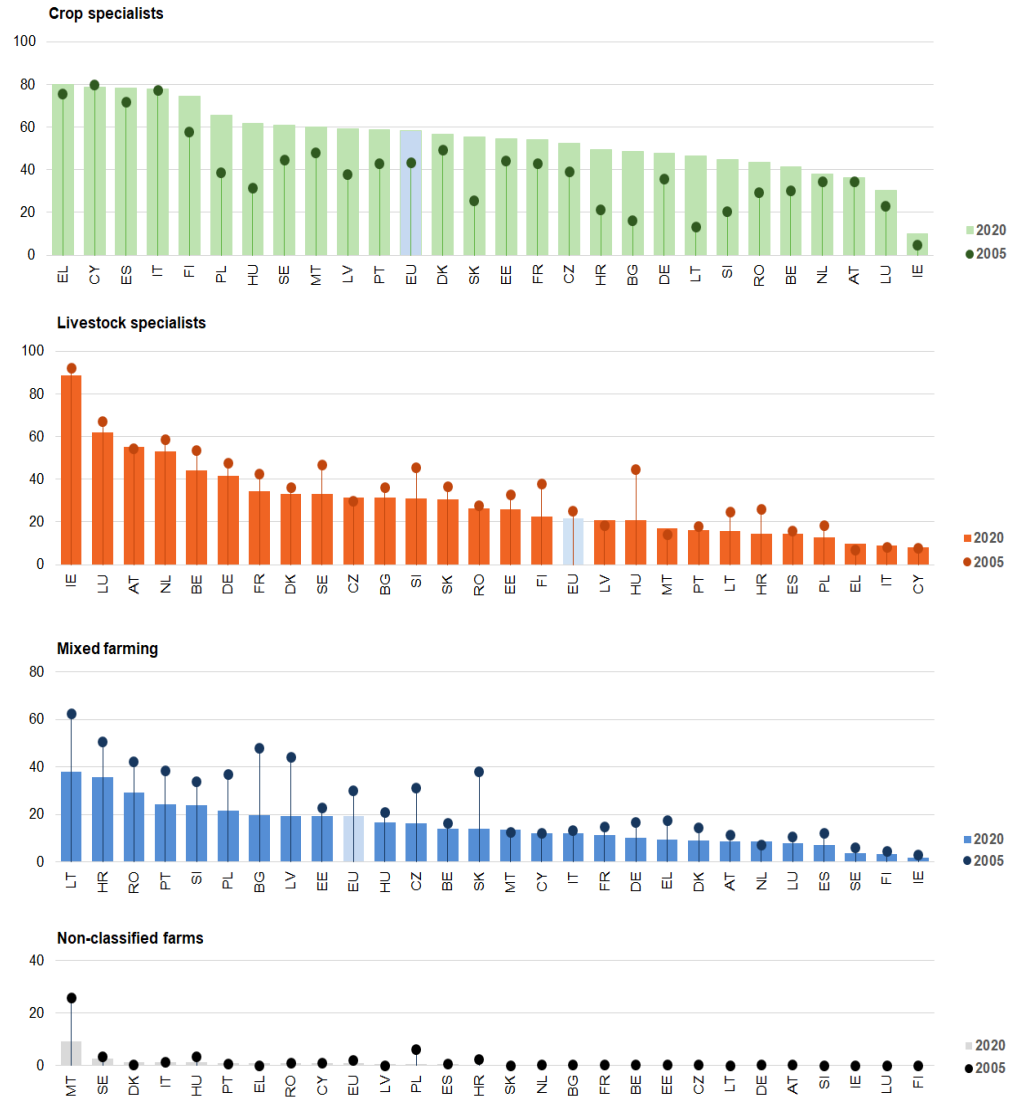
According to Eurostat (2023), in the year 2022, all three indices recorded a considerable upswing, indicating substantial growth or the emergence of inflationary pressures in that year. Before 2021, the volume index was surprisingly steady compared to the nominal value and price indices, which exhibit more significant variability, implying irregular price changes not always consistent with production volume adjustments. The most significant growth rates were observed in Estonia, where there was a surge of 44.4% in output value. Poland followed closely with a significant increase of 43.2%, albeit based on its national currency metrics. Lithuania registered a substantial rise as well, with output value climbing by 42.2%. Several other European countries have seen a notable increase in their agricultural output values, with Latvia, Germany, Finland, Ireland, Austria, Slovakia, and Slovenia all experiencing increases ranging from 20% to 35%. This suggests a widespread trend of growth. In contrast, Cyprus highlights an increase of 4.9%, Romania recorded a more moderate increase of 5.5% - also in local currency terms - and Spain registered a 9.9% rise in the value of output. While these increases are more moderate than the others, they signal a positive shift in agricultural output value.

Farm specialization

During the period 2005 to 2020, there appears to be a dynamic shift in farm specialisation within the EU. This shift may be influenced by factors such as EU agricultural policy, technological progress, market globalisation, environmental concerns, and changes

in consumer preferences. The variation among countries highlights the heterogeneity within the EU concerning agricultural practices and structural modifications within the agricultural sector. In order to analyze the shift in farm specialisation within the EU, the data employed for analyses were available during the time interval of 2005 to 2020. In this context, for the analysis it was considered the range head.

Figure 2. Farm specializations: crop, livestock, and mixed farming, (% share of all farms, 2005 and 2020)



Source: Eurostat, 2023 (online data code: ef_lus_main)

Figure 2 illustrates a comparison of the percentage distribution of different types of farm specialisations across EU member states for 2005 and 2020. The four specialisations are categorized as Crop Specialists, Livestock Specialists, Mixed Farming, and Non-Classified Farms. This data enables an analysis of the changes and trends in agricultural practices over 15 years

According to Figure 2, the agricultural sector in the EU is diverse and places a strong emphasis on both crop and livestock farming. The production of crops, specifically through field cropping and the cultivation of cereals, oilseeds, and protein crops, constitutes a significant portion of the agricultural industry. Meanwhile, livestock farming is also significant, with a specific focus on dairy and mixed farming practices. The existence of diverse and multifaceted farms indicates that EU farmers are utilizing techniques to optimize their resources and potentially safeguard against fluctuations in the market and climate. The diversification of farm specializations illustrates the varied climates, cultures, and dietary habits within the EU. There is a noticeable variation in the proportion of holdings specialising in crop production between countries, with some countries showing a marked decrease and others an increase over the 15-year period, which may indicate a change in agricultural policy, adaptation to market requirements, or environmental changes affecting the viability of crops. In contrast, the reduction in the number of farms solely dedicated to crops across the EU was less pronounced compared to those that focused on mixed or livestock farming.

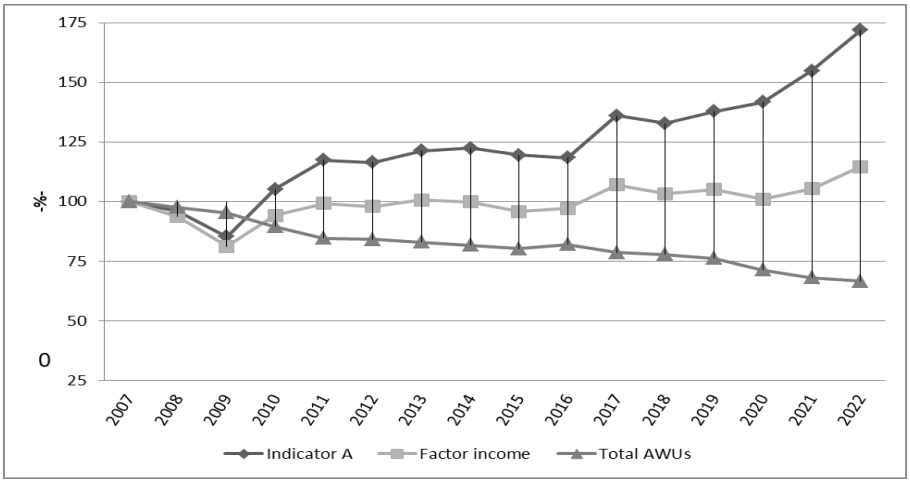
The increase in crop specialist farms within some Member States, including Croatia, Portugal, and Lithuania, suggests a potential shift from livestock specialization or mixed farming towards crop specialization. Greece boasted the highest percentage of crop specialist farms, rising slightly from 75.7% in 2005 to 80.0% in 2020. In contrast, only 9.9% of Ireland's farms specialized in crops. Most Member States experienced an increase in the proportion of farms specializing in crops, particularly in Hungary, Bulgaria, and Lithuania. Italy and Cyprus deviated from this trend, displaying minimal change, although in both countries almost four-fifths of the holdings were already specialised in crops.

Countries with the highest proportion of crop specialists in 2020 are predominantly situated in the eastern and southern regions of Europe. This may reflect the agronomic conditions and economic situations that favour crop specialisation in these regions. Economic factors such as market saturation or reduced profitability may also contribute to this trend. A reduction in specialisation in livestock farming can be observed in multiple European Union (EU) countries, and several factors may be influencing this trend. These include the escalating expenses associated with livestock farming, the possibility of a shift in consumer preferences towards diets comprised primarily of plant-based products, and heightened standards set by regulatory bodies

Work performance in the agricultural sector

An important indicator in measuring agricultural performance is Agricultural income per annual work unit (Indicator A) and key components.

Figure 3. Agricultural income per annual work unit (Indicator A) and key components (2007 = 100, EU, 2007-2022)



Source: authors based on Eurostat, (2023), and Euroststst (2023a - online data codes: aact_eaa06, aact_eaa05, and aact_ali02)

Figure 3 presents the trend of 'Agricultural income per annual work unit' (Indicator A) and its components 'Factor income' and 'Total Annual Work Units (AWUs)' in the European Union (EU) from 2007 to 2022. The figure utilizes 2007 as the base year (2007 = 100) and suggests that the EU agricultural sector is undergoing a transformation characterised by increasing income per AWU and sustained factor income, despite a declining agricultural labour force.

There is a significant rise in Indicator A (agricultural income per AWU) from 2007 to 2022, with certain fluctuations. Particularly, after 2020, there is a distinct surge, thus indicating a noteworthy increase in agricultural income per AWU in the final two years of the dataset. The marked rise in Indicator A after 2020 can be associated with several factors, including alterations to agricultural policy, shifts in the market, and the influence of global events, such as the COVID-19 pandemic, on farming practices and food prices. Additionally, factor income has also experienced a growing trend during the same period, but with less fluctuation in comparison to Indicator A. Therefore, it suggests that factor income (involving land, labour, capital, and entrepreneurship) in agriculture has steadily increased.

The total number of annual working units (AWUs) is decreasing, implying a decline in the number of individuals employed in the agriculture sector or an improvement in sectoral efficiency via mechanisation.

According to Eurostat (2023), the agricultural sector in the European Union saw a significant increase in income in 2022, as measured by the real factor income per Agricultural Work Unit (AWU), which rose by 11.0% compared to the previous year. This was primarily attributable to an 8.6% growth in factor income, achieved despite a 2.1% reduction in the total agricultural workforce.

Upon examination of individual EU member states, a distinct trend of growth or stability in agricultural income per AWU was identified in 2022. This trend was particularly noticeable in some of the EU's primary agricultural producers. According to Eurostat, (2023), datasets, Germany demonstrated a 57.8% increase, followed by Poland with a 23.6% rise, France with 11.5%, and Italy with 9.0%. Other noteworthy percentage increases were recorded in Luxembourg (31.8%), Estonia (29.0%), Sweden (26.4%), Austria (25.4%), Ireland (16.7%), Slovenia (15.0%), Belgium (13.6%), Lithuania (12.6%), Denmark (12.4%), and Greece (11.4%).

However, the upward trend in agricultural income per AWU was not consistent throughout the EU. Some countries suffered significant downturns. Romania experienced the steepest decline, with a decrease of 21.8%, followed by Portugal and Malta, which saw declines of 10.5% and 9.0% respectively. These varying trends underline the diverse economic landscapes and challenges that EU member states encounter within the agricultural industry. Figure 3 suggests that the agricultural sector in the EU is undergoing a transformation characterized by increased income per AWU and sustained factor income, despite a declining agricultural workforce. This points to a potential increase in efficiency and productivity but also necessitates a closer examination of labor dynamics and rural development policies.

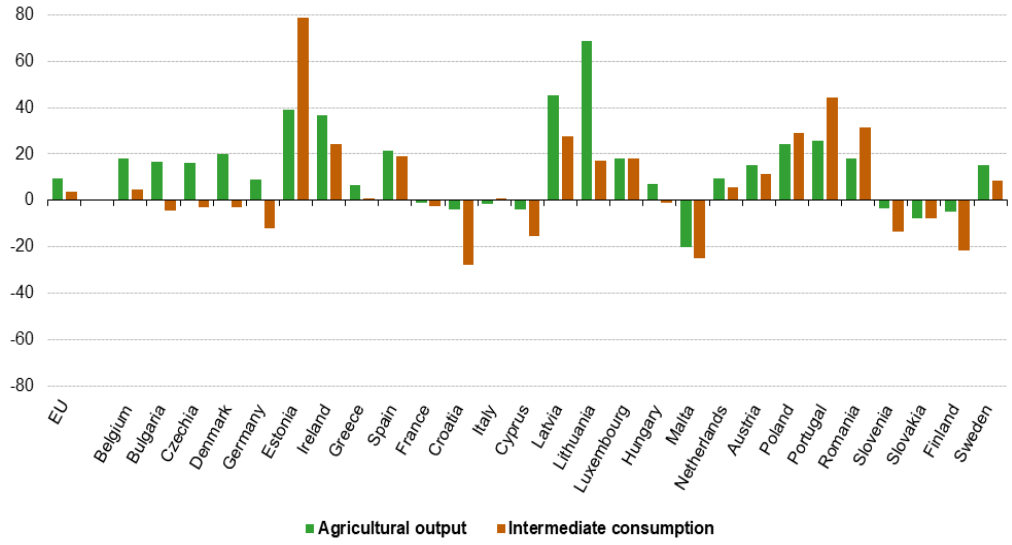
The divergence between the trends of Indicator A and Total AWUs might suggest that the increase in agricultural income per AWU is not necessarily due to increased factor income alone but could be influenced by a reduction in the labor force (AWUs). This could be a result of technological advancements leading to mechanization, thus requiring fewer workers but resulting in higher income per remaining worker. The resilience of factor income in the face of declining AWUs may be indicative of successful adaptation within the agricultural sector to external pressures, such as environmental challenges or changing market demands.

The stable increase in factor income indicates that the overall economic environment for agriculture has been improving. This could be due to better market prices for agricultural products, more efficient production methods, or supportive agricultural policies. In terms of economics, the decline in total AWUs together with the increase in income per AWU could indicate higher productivity per worker. However, it may also raise concerns about the sustainability of agricultural labour markets and rural economies. The information may also reflect wider socio-economic trends such as urbanisation, which may draw labour away from agriculture, or demographic changes such as an ageing rural population.

Agricultural productivity and consumption

Agricultural productivity and consumption are critical indicators of the economic health of the agricultural sector. These indicators not only reflect the efficiency and sustainability of agricultural practices but also have profound implications for food security, trade balances, and environmental sustainability. According to (Vasile et al. 2022), the agricultural output volume indices reflect the relative level of agricultural goods produced, while intermediate consumption reflects the resources used to produce these goods.

Figure 4. Change in the volume indices of agricultural output and of intermediate consumption in EU-27, (%, 2007-2022)



Source: Eurostat, (2023a) (online data codes: aact_eaa05)

Figure 4 displays the change in volume indices of agricultural output and intermediate consumption among the EU member states between 2007 and 2022, offering a comprehensive insight into the agricultural economic dynamics within the EU. At the EU level, there appears to be a slight overall decrease in agricultural output and a more marked decrease in intermediate consumption. This suggests that while agricultural production has not significantly grown, the efficiency of input use may have improved.

The data presented in Figure 4 offers an overview of varying trends in agricultural productivity and input use across the EU. While some countries exhibit growth and efficiency, others show signs of contraction, each with its unique set of economic, environmental, and policy implications.

Germany standout with a significant increase in agricultural output and a slight rise in intermediate consumption which suggests a strong growth in productivity and possibly an expansion or intensification of agricultural production. In the case of Ireland,

both output and intermediate consumption have increased significantly, indicating an expansion in agricultural activities which may also be becoming more resource-intensive. Also, Estonia and Luxembourg recorded substantial increases in output with relatively stable intermediate consumption, suggesting they have made efficiency gains.

Malta and Slovakia demonstrate significant declines in both output and intermediate consumption, indicating a contraction in the agricultural sector, possibly due to structural challenges or external pressures. Ireland, Estonia, and Luxembourg also demonstrate notable increases in agricultural output without a corresponding rise in intermediate consumption, which could imply a similar trend of improved efficiency. On the other end, Romania and Slovakia show a decrease in agricultural output alongside a rise in intermediate consumption which indicates a potential issue with agricultural productivity or adverse conditions such as economic challenges, environmental factors, or policy changes that could be impacting output.

Figure 4 also highlights countries like Portugal, Greece, and Spain, where there is a reduction in both output and intermediate consumption. While this could suggest a decrease in the overall scale of agriculture, it may also reflect a shift towards less resource-intensive farming or a response to decreased demand.

Conclusions

The agricultural sector in the European Union is shaped by multiple elements like crop yield, financial returns, pricing dynamics, and green practices. The EU's farming industry faces obstacles related to trade instability, heightened prices of commodities, and the ongoing climate crisis. As a result, these factors are likely to affect the growth in key agricultural areas in the upcoming years.

The main findings are the general framework of the agricultural trends and could employed by policymakers, economists, and stakeholders in the agricultural sector to analyze the performance, identify best practices, and address challenges within the EU's agricultural industry. It is important to consider that these figures could be influenced by many factors, including policy changes, economic conditions, technological advances, environmental factors, and shifts in demand.

Limitations and future direction of research

In the context of ongoing sectoral transformations, investigating the evolution of the European agricultural sector with a focus on country-specific components represents a highly relevant and wide-ranging area of research. The current research, while attempting to be comprehensive in its approach to the assessment of the dynamics of the agricultural sector of the European Union from the Romanian perspective, encounters several limitations that should be taken into account. Market dynamics and environmental factors have a major impact on the agricultural sector, and these complex and rapidly changing factors are not captured in this research. The descriptive nature of our analysis provides an overview of the existing conditions, without expanding

any of the argumentation or emphasis on some of the possible causal relationships among the variables employed in the analysis. In this context, future research could address and expand the topic by including additional data and variables and taking into consideration a more contextual approach.

Conflict of interests

The authors declare no conflict of interest.

References

1. Ait Sidhoum, A., Canessa, C., & Sauer, J. (2023). Effects of agri-environment schemes on farm-level eco-efficiency measures: Empirical evidence from EU countries. *Journal of agricultural economics*, 74(2), 551-569.
2. Amuda, Y. J. (2022). Evaluation of Agricultural Policies and Programmes for Sustainable Future Farming Intensification in Nigeria. International Journal of Service Science, Management, *Engineering, and Technology (IJSSMET*), 13(1), 1-13.
3. Andrei, J. V., & Dragoi, M. C. (2019). Analysis of the European agricultural context. In The common agricultural policy and Romanian agriculture (pp. 32-62). Wallingford UK: CABI.
4. Andrei, J. V., Popescu, G. H., Nica, E., & Chivu, L. (2020). The impact of agricultural performance on foreign trade concentration and competitiveness: empirical evidence from Romanian agriculture. *Journal of Business Economics and Management,* 21(2), 317-343.
5. Andrei, J. V., Popescu, G. H., Nica, E., & Chivu, L. (2020). The impact of agricultural performance on foreign trade concentration and competitiveness: empirical evidence from Romanian agriculture. *Journal of Business Economics and Management*, 21(2), 317-343.
6. Anghelache, C. (2018). Structural analysis of Romanian agriculture. *Romanian Statistical Review Supplemen*t, 66(2), 11-18.
7. Bertoni, D., Cavicchioli, D., & Latruffe, L. (2023). Impact of business transfer on economic performance: the case of Italian family farms. *International Journal of Entrepreneurship and Small Business,* 48(2), 186-213.
8. Borda, Á. J., Sárvári, B., & Balogh, J. M. (2023). Generation Change in Agriculture: A *Systematic Review of the Literature. Economies*, 11(5), 129.
9. Borodina, O., Yarovyi, V., & Mykhailenko, O. (2017). Agricultural land concentration and land grabbing in the EU: modern challenges. *Economy and Forecasting*, (4), 109-124.
10. Choi, H. S., Jansson, T., Matthews, A., & Mittenzwei, K. (2021). European agriculture after Brexit: does anyone benefit from the divorce*?*. *Journal of Agricultural Economics,* 72(1), 3-24.

11. Constantin, M., Rădulescu, I. D., Andrei, J. V., Chivu, L., Erokhin, V., & Gao, T. (2021). A perspective on agricultural labor productivity and greenhouse gas emissions in context of the Common Agricultural Policy exigencies. *Економика пољопривреде*, 68(1), 53-67.
12. Crecana, D. N., & Crecana, C. D. (2019). Increasing the Performance of Agricultural Holdings in Romania-an Imperative for their Management. *Revista de Management Comparat International*, 20(2), 112-121.
13. Denisa, I., Jean, R., Andrei, V., Chivu, L., Erokhin, V., Gao, T., & Nancu, D. (2022). A short review on European developments in agricultural output price indices during 2008-2017: Are there significant changes?. *Економика пољопривреде*, 69(1), 107-117.
14. Dias, C., Gouveia Rodrigues, R., & Ferreira, J. J. (2021). Small agricultural businesses' performance—What is the role of dynamic capabilities, entrepreneurial orientation, and environmental sustainability commitment?. *Business Strategy and the Environment*, 30(4), 1898-1912.
15. Eder, A., Salhofer, K., & Scheichel, E. (2021). Land tenure, soil conservation, and farm performance: An eco-efficiency analysis of Austrian crop farms. Ecological Economics, 180, 106861.
16. Eurostat (2022).Agri-environmental indicator – specialization, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicator_-_specialisation#Assessment, accessed: [07.10.2023].
17. Eurostat (2023).Performance of the agricultural sector, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Performance_of_the_agricultural_sector#Value_of_agricultural_output, accessed: [09.11.2023].
18. Eurostat (2023a), Economic accounts for agriculture - indices: volume, price, values, available at: https://ec.europa.eu/eurostat/databrowser/explore/all/agric?lang=en&subtheme=agr.aact.aact_eaa&display=card&sort=category&extractionId=AACT_EAA05, accessed: [03.10.2023].
19. Eurostat (2023b), AGRICULTURE Database section, available at: https://ec.europa.eu/eurostat/web/agriculture/database, accessed: [05.10.2023].
20. Eurostat (2023c), Statistics Explained on agriculture, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agriculture, accessed: [07.10.2023].
21. Florea, A. M., Capatina, A., Radu, R. I., Serban, C., Boboc, M. G., Stoica, C., ... & Stanciu, S. (2019). Limiting Factors that Influence the Formation of Producer Groups in the South-East Region of Romania: A Fuzzy Set Qualitative Comparative Analysis (fsQCA). *Sustainability*, 11(6), 1614.
22. Garske, B., Bau, A., & Ekardt, F. (2021). Digitalization and AI in European agriculture: a strategy for achieving climate and biodiversity targets?. *Sustainability*, 13(9), 4652.

23. Giannakis, E., & Bruggeman, A. (2015). The highly variable economic performance of European agriculture. *Land Use Policy*, 45, 26-35.

24. Guth, M., & Smędzik-Ambroży, K. (2020). Economic resources versus the efficiency of different types of agricultural production in regions of the European Union. Economic research-*Ekonomska istraživanja*, 33(1), 1036-1051.

25. Han, S. H. (2016). An Analysis of Ex-post Evaluation on Korea-EU FTA with respect to the Agricultural Sector. *Journal of the Korea Academia-Industrial cooperation Society*, 17(7), 648-655.

26. Himics, M., Fellmann, T., & Barreiro-Hurle, J. (2020). Setting climate action as the priority for the common agricultural policy: a simulation experiment. *Journal of Agricultural Economics*, 71(1), 50-69.

27. Jarosz-Angowska, A., Nowak, A., Kołodziej, E., & Klikocka, H. (2022). Effect of European Integration on the Competitiveness of the Agricultural Sector in New Member States (EU-13) on the Internal EU Market. Sustainability, 14(20), 13124.

28. Mastronardi, L., Giaccio, V., Giannelli, A., & Scardera, A. (2015). Is agritourism eco-friendly? A comparison between agritourisms and other farms in Italy using farm accountancy data network dataset. *SpringerPlus*, 4(1), 1-12.

29. Nilsson, P., Bommarco, R., Hansson, H., Kuns, B., & Schaak, H. (2022). Farm performance and input self-sufficiency increases with functional crop diversity on Swedish farms. Ecological Economics, 198, 107465.

30. Pantović, D., Luković, M., Lakićević, M. (2023), Evaluation of tourism at rural areas in the European Union, *Proceedings of the Faculty of Economics in East Sarajevo*,, Issue 27, 11-18.

31. Pishgar-Komleh, S. H., Čechura, L., & Kuzmenko, E. (2021). Investigating the dynamic eco-efficiency in agriculture sector of the European Union countries. *Environmental Science and Pollution Research*, 28(35), 48942-48954.

32. Popescu, G. H., Andrei, J. V., Nica, E., Mieilă, M., & Panait, M. (2019). Analysis on the impact of investments, energy use and domestic material consumption in changing the Romanian economic paradigm. *Technological and Economic Development of Economy*, 25(1), 59-81.

33. Radenovic, Ž., Krstić, B., & Marković, M. (2022). Economic Performance of Agriculture in the European Union Countries. *Zagadnienia Ekonomiki Rolnej*, 370(1), 5-21.

34. Reidsma, P., Ewert, F., & Oude Lansink, A. (2007). Analysis of farm performance in Europe under different climatic and management conditions to improve understanding of adaptive capacity. *Climatic Change*, 84, 403-422.

35. Rybaczewska-Błażejowska, M., & Gierulski, W. (2018). Eco-efficiency evaluation of agricultural production in the EU-28. *Sustainability*, 10(12), 4544.

36. Stoian, M., Ion, R. A., Turcea, V. C., Nica, I. C., & Zemeleaga, C. G. (2022). The Influence of Governmental Agricultural R&D Expenditure on Farmers' Income—Disparities between EU Member States. *Sustainability*, 14(17), 10596.

37. Vasile, A. J., Rădulescu, I. D., Chivu, L., Erokhin, V., Nancu, D., Gao, T., & Vasić, M. (2022). A short descriptive analysis of the European evolutions of input price indices of agricultural products between 2008-2017: patterns, trends and implications. *Strategic Management*, 27(3), 39-47.