

ECONOMIC AND SOCIAL INDICATORS IN AGRICULTURE OF THE EUROPEAN UNION

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Abstract: *The purpose of examining the economic and social indicators in the agricultural sector of the European Union (EU) was to identify the structural changes that occurred during the period 2012–2023, taking into account the changes in the number of Member States over time. The economic indicators were analyzed using the following values: Gross Domestic Product at market prices (GDP), GDP per capita (in euro per capita), Gross Value Added (GVA) in agriculture, forestry, and fishing, the value of Standard Output (SO), and the trade balance of the agri-food industry. Social indicators were monitored through the number of employees in agriculture, forestry, and fishing (AFF), as well as the size of the rural population. For the purposes of research and data analysis, methods of descriptive statistics, temporal comparability, induction, and deduction were applied. The results of the analyzed indicators reveal that EU Member States are predominantly highly developed economies, given the low share of GVA in AFF in total GDP, as well as the relatively small proportion of agricultural employment in total employment.*

Key words: *GDP, GVA in AFF, standard output, trade balance, rural population, employment in agriculture.*

JEL classification: *E60, F10, O10*

1. INTRODUCTION

In the available literature, agriculture is highlighted as a key ally of economic development and is therefore regarded as the most important factor of

rural development. This sector requires continuous investment and government financial support in order to remain competitive (Jeločnik et al., 2024). The significance of agriculture is primarily observed through the income it generates, both in terms of its contribution to the country's overall GDP and through the values of SO and the population living in rural areas. The importance of agriculture can also be measured through employment in the AFF sector, as increasing numbers of people migrate to urban areas, raising the question of whether agriculture is pursued mainly by those who have not found a way to leave rural areas for cities (Ajibade et al., 2024). Generally speaking, agriculture is more important to developing countries than to developed ones (van Arendonk, 2015).

More than fifty years ago, prominent twentieth-century economists emphasized the importance of agriculture for the development of the entire economy, particularly in low-income countries. These dynamics stemmed from population growth, the creation of new employment opportunities, and their role in reducing poverty, all with the aim of achieving greater wealth (Thornton, 1973).

The strategic objective of agriculture is to ensure global food security while simultaneously preserving biodiversity, landscapes, and regional distinctiveness (OECD, 2020). The agri-industrial complex, as a distinct economic sector, also poses geopolitical challenges for many European countries (Gabdualiyeva et al., 2024). Agriculture is thus recognized as a highly significant sector in EU countries, representing a key precondition for the sustainable development of the entire

economy. The agricultural sector in EU Member States serves as a driver of agribusiness development and an engine of overall economic progress, particularly in developing countries (Bajdor et al., 2020). In countries such as Nigeria, where poverty is widespread, agriculture is considered an essential catalyst of economic development (Ajibade et al., 2024).

It is widely acknowledged that agriculture must contribute to global food security, and to achieve this, its products must be competitive and supportive of the sustainable development of the sector (Bocean, 2024). This requires cooperation between institutions at both the horizontal and vertical levels. Only in this way can long-term benefits for the agricultural sector and farmers be ensured. The positive spillover effects of a well-organized and interconnected agricultural sector with other institutions would extend to the entire economic system (Ehlers et al., 2022).

Today, the EU expects agricultural policy to establish a sustainable food production system (Davies, 2020). Moreover, the EU considers that support for the agri-food sector could also be achieved through greater applicability of digitalization and its yet-to-be-determined specific features (Rose & Chilvers, 2018). Special attention should therefore be paid to digitalization, as it can significantly stimulate faster economic growth. Some authors argue that digitalization in agriculture yields not only economic but also environmental benefits (Bocean, 2024). According to Bocean (2024), Luxembourg has achieved a high level of efficiency and digitalization in its economy, making it the most technologically advanced and economically developed EU Member State. In agriculture, this country also benefits from a highly skilled workforce, which results in high productivity. Consequently, some authors (Chaudhary & Mishra, 2021) argue that economic policy should focus on increasing production and productivity in order to enhance the contribution of agriculture to GDP.

The agricultural sector contributes to economic development also from the perspective of employment, thereby reducing poverty, increasing income, and driving structural economic change. Although agriculture employs the largest share of the workforce in developing countries, there are still differences in the share of agricultural employment within total employment, which primarily depends on the status of employment. This refers to the fact that agricultural producers may be self-employed, employed in cooperatives, or engaged on family farms (Cheong & Marion, 2013). As early as 2014, the World Bank categorized countries into different groups depending on agriculture's contribution to GDP

and the share of AFF employment within total employment (Table 1).

Table 1. Agriculture's role in national economy

Label	Share of GVA in agriculture in total GDP	Share of employed in agriculture in total employment
<i>Agriculture-based countries</i>	More than 25%	More than 50%
<i>Pre-transition countries</i>	Less than 50%	More than 50%
<i>Transition countries</i>	Less than 25%	Agriculture employs between 25% and 50%
<i>Urbanizing countries</i>	Less than 25%	Agriculture employs between 10% and 25%
<i>Developed countries</i>	Less than 10%	Less than 10%

Source: World Bank, 2015.

When Luxembourg is compared with another non-European, non-EU country, such as Uzbekistan, it becomes evident that the agricultural sector accounts for 28.7% of GDP (Rakhimberganovich, 2024), employs 33.2% of the total workforce, and that every second inhabitant lives in rural areas. A similar situation is observed in India and other medium- or low-income countries, whereas in highly developed countries, only about 2% of the total population is employed in agriculture (Alston & Pardey, 2014).

The EU has ample reason to stimulate the economic and social development of underdeveloped regions, reduce regional disparities, lower unemployment rates, and so forth. Through its policy of coordinated economic and social development, the EU also contributes to the sustainable development of Member States' economies. It is well known that Member States must first define their own economic and social development priorities, after which the EU formulates common objectives. Equally important is the fact that the EU directs part of its financial resources toward underdeveloped areas and countries (Aničić & Veličković, 2019).

2. MATERIAL AND METHOD OF WORK

The primary sources of data for this research are secondary sources, with particular emphasis on the Eurostat statistical database (Eurostat, 2024d) and the World Bank (2024). In addition, other relevant scientific and professional literature of significance to the research topic has been used.

The analysis is carried out from the perspective of key parameters of economic and social development. The indicators representing *economic values* include: Gross Domestic Product at market prices (GDP),

GDP per capita (in euro per capita), Gross Value Added (GVA) in agriculture, forestry, and fishing (in million euro), the value of Standard Output (SO), and the trade balance of the agri-food industry (in billion euros). *Social development indicators* are observed through employment (aged 15 years and over) in agriculture, forestry, and fishing (AFF), as well as the share of the rural population in the total population of the European Union (EU) between 2012 and 2023.

GDP at market prices is the most frequently used parameter for expressing the economic strength of a country over a calendar year (Grujić Vučkovski et al., 2023), and it is often employed to assess living standards, social progress, and related dimensions. Moreover, GDP at market prices reflects the value of production generated by domestic aggregated economic units (Tjukanov, 2011). When the total GDP is divided by the country's population, the resulting GDP per capita value reflects the standard of living, whereby a higher GDP per capita implies a higher living standard (Statista, 2024).

GVA represents the difference between output calculated at constant prices and intermediate consumption calculated at purchaser's prices (Eurostat, 2024c). This study analyzes the share of GVA in AFF in EU Member States over the period 2012–2023. The SO indicator represents the average value of agricultural production, calculated at input prices and expressed in a given currency (in this case, euros). The collected SO data provide essential information on the structure of agricultural holdings in EU countries. Specifically, the data describe the structure of agricultural holdings in terms of utilized agricultural area (UAA), livestock units (LSU), and economic size (SO value). To this end, the following variables and their measurement units were employed: UAA in hectares, number of livestock in LSU, standard output (SO) in euros, and the number of agricultural holdings by these characteristics. SO values are not monitored annually; instead, they are collected in years when the Census of Agriculture is conducted (every ten years) or through the Farm Structure Survey (two or three times between censuses).

This practice is consistent with the recommendations of the Food and Agricultural Organization of the United Nations (FAO) (Eurostat, 2024e). Accordingly, SO data are reported for the following years: 2010, 2013, 2016, and 2020.

In crop production, SO is expressed in euros per hectare, whereas in livestock production it is expressed in euros per livestock unit. The purpose

of calculating SO values is to classify agricultural holdings by type of agricultural production, grouping them into categories according to their economic size (SO value). Until 2007, the Standard Gross Margin (*abbr.* SGM) was used to classify farms by economic size and type of agricultural production (EC, No 377/1985). Since 2010, the SO indicator has been applied (EC, No 1242/2008 and No 1198/2014). These indicators differ in terms of their calculation methodology and the elements they comprise (Table 2).

Table 2. Differences between SGM and SO

SGM (until 2007)	SO (from 2010)
- included value of output;	- direct payments excluded;
- included costs of direct payments;	- production costs included;
- unit of measurement is 1,200 euros (<i>abbr.</i> ESU).	- feed requirements included in certain cases;
	- unit of measurement is euro.

Source: Eurostat, 2024

*Note: According to the data available on Eurostat (2024a) on agricultural holdings (farms), the SGM of 1,200 euros was the unit of measure used to measure the economic strength of agricultural holdings. SGM was estimated according to the area used or the number of cattle and the area coefficient. The sum of these values was divided by 1,200, which transformed it into the ESU indicator.

We will also consider their calculation formulas to make the differences clearer (Eurostat, 2024):

$$SGM = SO + DP - C \quad (1)$$

where is *SO* – standard output, *DP* – direct payments, *C* – costs.

As can be seen from the equation (1) and Table 2, SO does not contain the value of direct payments, because they cannot be tied to a certain specific production.

Also, when the measures of the common agricultural policy (*abbr.* CAP) came into force, which entailed separating the costs of direct payments from other groups of costs, it was necessary to exclude the costs of direct payments so that in certain situations their value would not exceed the output (Eurostat, 2024).

When it comes to the foreign trade exchange of agricultural and food products, they are defined in Europe by certain codes and are an integral part of the Standard International Trade Classification (*abbr.* SITC). The characteristics of these variables are presented in a table (Table 3).

Table 3. Characteristics of variables of foreign trade exchange of EU countries

Reporting country	EU member state	Time period	2012-2023
Partner country	Goods traded by the EU Member States with non-EU countries (world)	Frequency	Annual
Trade value	Euro	Observed products*	0 Food and live animals; 1 Beverages and tobacco; 2 Crude materials, inedible, except fuels, and 4 Animal and vegetable oils, fats and waxes. By adding certain groups and subgroups within the observed category, and finally the sum of the analyzed categories, it gives us the result of realized exports, imports and the balance sheet in the sector of the agricultural and food industry of EU countries.

Source: Eurostat, 2024b

*Note: The agricultural and food industry consists of the following groups and subgroups: 0 Food and live animals (00-09); 11 Beverages; 12 Tobacco and tobacco manufactures; 21 Hides, skins and furskins, raw; 22 Oil-seeds and oleaginous fruits; 29 Crude animal and vegetable materials, n.e.s.; 41 Animal oils and fats, 42 Fixed vegetable fats and oils, crude, refined or fractionated; 43 Animal or vegetable fats and oils, processed; waxes of animal or vegetable origin; inedible mixtures or preparations of animal or vegetable fats or oils, n.e.s.

Trade of EU member states with the rest of the world (non-EU countries) is conducted under the auspices of legal regulations adopted by the European Commission, namely: Regulation (EC) No 471/2009 of the European Parliament and of the Council; Implementing Commission Regulation (EC) No. 92/2010; Implementing Commission Regulation (EC) No 113/2010 (Eurostat, 2024b). After 2010, changes to the existing regulations were also implemented in 2016 and published in the following numbers: No 2016/1253, 2016/1724, and No 2016/2119.

Our research included *two social indicators*. The first social indicator is shown through the participation of employees in AFF (in %) in the total number of employees, and it includes the employed population aged 15 and over. Another social indicator gave results on the participation of the rural population in the total population in the EU member states. Collected data on social indicators of the agricultural sector provide elementary information on the structure of agricultural holdings in EU countries. More precisely, the data describes the structure of the agricultural population from the aspect of participation in the total population and according to

employment in the AFF activity. The measurement unit used for their expression is percentage.

Descriptive statistics methods were used to interpret the collected statistical data, obtained results, tabular and graphical representations. The method of temporal comparability of collected data was also applied in the paper. In order to reach adequate conclusions, the methods of induction and deduction were used.

The research question that we started from during the writing of the paper was: *can empirical data on economic and social indicators of a given time series indicate structural changes in EU agriculture?*

3. RESULTS AND DISCUSSION

We know that the specifics of agriculture can be classified into several groups, namely: biological, organic, economic, social, and others (Grujić et al., 2019). In the continuation of the work, we will interpret the results of selected economic and social parameters of EU agriculture.

Results of the analysis of the observed parameters of economic development. In the period from 2012 to 2023. on the territory of the EU, the analyzed parameters moved differently (Table 4).

Table 4. Descriptive statistics of indicators of the economic development of EU agriculture

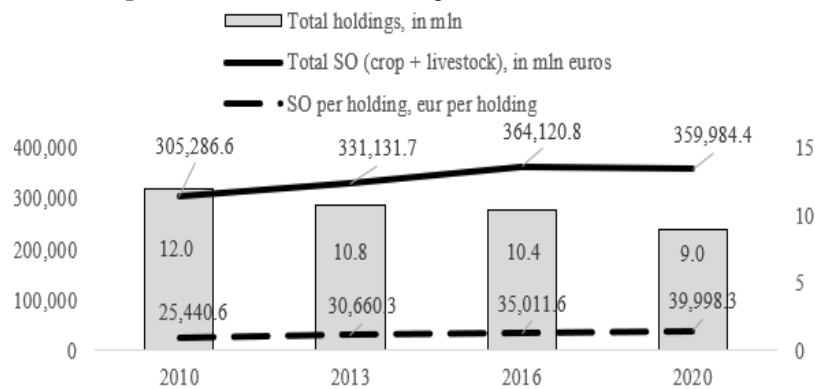
Variables	GDP (in million euros)	GDP (in euro per capita)	GVA of AFF (in million euros)	Trade balance of agricultural and food industry (in mlrd euros)	SO (in euro)
Average	13,424,122.7	30,064.2	222,539.6	32.3	340,130,916,652.5
St. Dev.	1,743,737.1	3,719.7	29,032.2	9.1	27,476,006,394.4
Cv, in %	0.13	0.12	0.13	0.28	8.1
AARC, in %	3.7	3.5	3.6	8.0	5.6

Source: Authors calculation based on Eurostat, 2024d

The results presented in Table 4 indicate that the observed economic indicators recorded positive average annual growth rates. By comparing the coefficients of variation, we can see that the variability of the balance of foreign trade exchange is 3.5 times higher than the variability of SO values, and in percentage terms by 350%. The average annual rate of change (AARC) indicates that the trade balance of the agricultural and food industry recorded the highest interannual growth, increasing at an average rate of 8% per year between 2012 and 2023. This high growth rate is driven by a higher average annual increase in the value of exports (+4.7%) compared to imports (+4.0%) of agricultural and food products during the observed period. We also observed that the GDP per capita followed the growth of the total GDP of the EU territory, which is a signal of a stable economy and economic progress of the

Union. Also, equally stable average annual growth is recorded by the values of GVA of agriculture, which indicates that agriculture is an important activity of the EU, not only because it produces food, but also because it contributes to the creation of the total GDP (average annual share of 1.7%). By analyzing the SO values of the EU agricultural sector, we have come to certain results about the structure of agricultural holdings. Given that these data are based on the census of agriculture and FSS, four reference years were included in the analysis: 2010, 2013, 2016, 2020. According to the statistical data of the Eurostat (2024d), it was observed that the total value of SO (crop and livestock production) increased by 17.9% in 2020 compared to 2010, while the total number of farms decreased by 25%. Despite this, the SO value generated per farm increased by 57.2% in the last year compared to the first analyzed year (Graph 1).

Graph. 1. SO values of the EU agricultural sector, 2010 - 2020

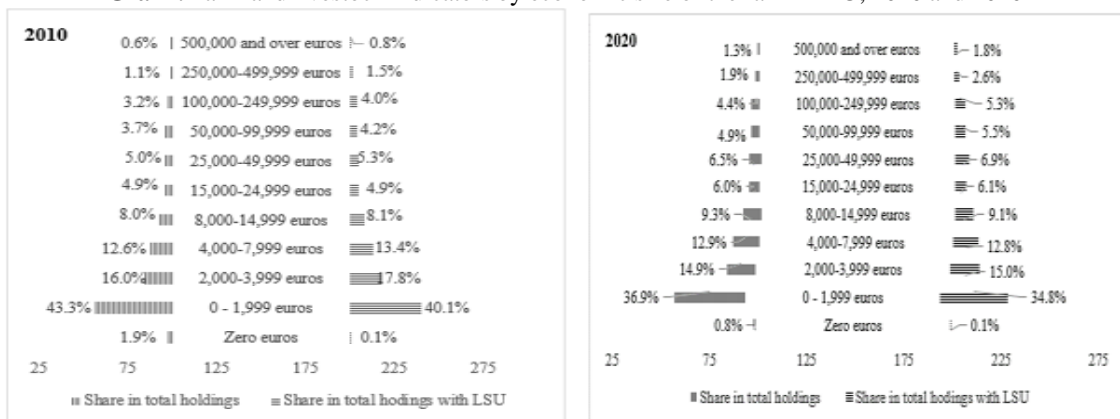


Source: Authors calculation based on Eurostat, 2024d.

Below is a graphic representation (Graph. 2) of the structure of the total number of farms and farms with LSU according to the realized SO value of the farm in 2010 and 2020. Graph 2 shows an increase in the share of both the total number of farms and farms with LSU that, in 2020 compared to 2010, achieved SO values exceeding 8,000 euros.

However, in the years compared, there is still a high share of agricultural holdings that achieve a SO value of up to 2,000 euros (43.3% in 2010 vs 39.6% in 2020). The same pattern is observed for farms with a value of SO up to 2,000 euros that have LSU (40.1% in 2010 vs 34.8% in 2020).

Graf 2. Farm and livestock indicators by economic size of the farm in EU, 2010 and 2020



Source: Authors calculation based on Eurostat, 2024d

The following tables show the structure of agricultural holdings depending on the area of UAA (Table 5) and the number of LSU (Table 6) in the total number of holdings in the total value of SO.

Table 5. Ownership structure of farms according to UAA, 2010-2020 (in %)

Value of UAA	2010	2013	2016	2020
Zero ha	2.1	1.5	2.1	1.4
0-2 ha	47.9	43.4	42.0	41.2
2-4.9 ha	20.6	21.2	21.4	21.2
5-9.9 ha	10.9	11.5	11.8	12.4
10-19.9 ha	7.4	7.9	8.0	8.7
20-29.9 ha	3.1	3.3	3.3	3.8
30-49.9 ha	3.1	3.4	3.4	3.9
50-99.9 ha	3.0	3.3	3.3	3.9
100 ha or over	2.4	2.7	2.9	3.6

Source: Authors calculation based on Eurostat, 2024d.

Table 6. Ownership structure of farms according to LSU, 2010-2020 (in %)

Number of LSU	2010	2013	2016	2020
Zero LSU	1.0	0.9	1.2	3.6
0-5 LSU	71.5	71.5	70.3	65.8
5-9.9 LSU	7.1	6.8	6.7	6.4
10-14.9 LSU	3.5	3.5	3.5	3.7
15-19.9	2.3	2.3	2.4	2.6
20-49.9	6.6	6.7	7.0	7.7
50-99.9	3.7	3.7	3.9	4.4
100-199.9	2.5	2.6	2.8	3.2
200-299.9	0.8	0.8	0.9	1.1
300-499.9	0.6	0.6	0.7	0.8
500 or over LSU	0.5	0.5	0.6	0.8

Source: Authors calculation based on Eurostat, 2024d.

According to the results presented in Table 5, we can see that the shares of the number of farms in certain groups of UAA availability were mostly approximate values between the census years. We can also see that the sum of the participation of farms that do not have UAA and have UAA up to 4.9 ha in 2010 was 70.5% compared to 63.8% in 2020. Therefore, we conclude that there was a consolidation of possessions in the observed years.

The total number of agricultural holdings with LSU in 2020 compared to 2010 decreased by 37%. A significant increase in the number of farms was observed in the category without LSU, while the number of farms with up to 10 LSUs decreased significantly. In the remaining intervals of available LSU, the participation of farms does not record significant changes.

Results of the analysis of the observed parameters of social development. Indicators of the participation of the rural population in the total

population and of those employed in the AFF activity in the total number of employed population in the EU from 2012 to 2023 were observed (tables 7 and 8).

Table 7. Descriptive statistics of social development indicators of EU agriculture

	Employment in AFF (000 persons)	Rural population
Average	8,857.9	113,755,127.7
St. Dev.	1,044.0	3,047,092.3
Cv, in %	11.8	2.7
AARC, in %	-1.6	-0.4

Source: Authors calculation based on Eurostat, 2024d.

According to Table 7, we can see that the AFF activity employed an average of 8.8 million persons with 15 years and over, while the rural population was about 113.7 million with small deviations from the average in the analyzed period. Overall, from 2012 to 2023, employment in the AFF sector declined at an average annual rate of 1.6%, while the rural population decreased by 0.4%.

Table 8. Share of the population employed in the AFF sector in total employment and share of the rural population in the total population, 2012–2023 (in %)

Year	Rural population	Employment in AFF
2012	26.6	5.6
2013	26.5	5.4
2014	26.3	5.3
2015	26.1	5.0
2016	25.9	4.8
2017	25.7	4.7
2018	25.5	4.5
2019	25.3	4.3
2020	25.	4.3
2021	24.8	3.8
2022	24.5	3.6
2023	24.3	3.5

Source: Authors calculation based on Eurostat, 2024d.

The number of employees in AFF in the EU decreased by almost 30% (7,286.4 thousand persons in 2023 vs. 10,355.3 thousand persons in 2012), while the number of rural population decreased by 8% (108,065.5 thousand persons in 2023 vs. 117,609.2 thousand persons in 2012). The results in Table 8 indicate that there was a decrease in the participation of the rural population in total (- 2.4 p.p.) and of those employed in the AFF activity in the total number of employees (- 2.1 p.p.) in the observed period.

Although the analysis in this paper is based on EU-level averages, it should be emphasized that substantial heterogeneity exists among EU Member States regarding the development and economic importance of agriculture. In highly developed economies such as Germany or the Netherlands, agriculture contributes a relatively small share to GDP and employment, reflecting advanced structural transformation, high productivity, and strong integration with agri-food value chains. In contrast, in Member States such as Romania and Bulgaria, agriculture remains a significantly more important sector, both in terms of employment and rural livelihoods, which is largely associated with lower levels of industrialization, higher shares of rural population, and a greater prevalence of small-scale farms. Therefore, EU averages tend to mask pronounced structural differences across Member States.

The observed changes in economic and social indicators of EU agriculture over the period 2012–2023 can be linked to several interrelated causal factors. Technological progress and digitalization have contributed to productivity growth and consolidation of agricultural holdings, resulting in a decline in the number of farms and agricultural employment, but an increase in output per holding. At the same time, demographic processes such as rural–urban migration and population ageing have accelerated the reduction of the agricultural workforce and rural population. In addition, the Common Agricultural Policy (CAP) has played a crucial role in shaping structural change by supporting farm modernization, competitiveness, and income stability, while also influencing land consolidation and production specialization. These factors jointly explain the long-term decline in agricultural employment alongside stable or increasing economic performance of the sector.

CONCLUSION

Through this research, we were able to answer the research question. By collecting and analyzing empirical data on economic and social indicators, we identified structural changes in EU agriculture over the period 2012–2023. Overall, the results show that the observed economic and social indicators reflect significant changes in EU agriculture.

If we look at the economic indicators individually, we conclude the following:

- positive average annual growth rates of economic indicators were determined,
- the agricultural and food industry of the EU achieved a surplus in foreign trade with countries that are not members of the EU,

- share of GVA in AFF of 1.7% (annual average) shows that EU member countries are predominantly developed countries,
- the total value of SO is higher by 17.9%, while SO by farm is higher by 57.2% in the last year compared to the first analyzed year,
- there was an increase in the number of farms with LSU that achieved a SO value of more than EUR 8,000,
- the participation of farms that are without UAA or cultivate up to 4.9 ha has decreased, which may be a signal that there is a possible consolidation of holdings,
- an increase in the number of households without LSU was established.

The analysis of the social parameters of EU agriculture in the observed period revealed the following changes:

- the number of employees in the AFF activity was reduced by 30%,
- the share of rural people in the total population decreased by 8%,
- employment in the AFF sector as a share of total employment decreased at an average annual rate of 1.6%, which is faster than the decline in the rural population (-0.4%) over the analyzed period.

According to the obtained results, we can say that the observed indicators showed that there were structural changes in EU agriculture in the observed period, which confirmed the research question.

Given that changes in a country's agricultural and food systems affect the global economy, it is essential to ensure access to new ideas, techniques, technologies, and employment opportunities that can have a broader global impact. Therefore, future research could examine the impact of agricultural innovations on the social and economic aspects of food production, as well as on agricultural policy.

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