# SUSTAINABILITY AND COMPLEMENTARITY OF AGRICULTURE AND RURAL AREAS IN THE EU

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The main tasks of agriculture are undoubtedly food production and fulfilling its non-productive functions. This complementarity is realised particularly in the rural area. The aim of this paper is to evaluate the economic performance of selected EU countries in terms of labour productivity in the rural space and agrarian space, first from a macroeconomic perspective. From a microeconomic perspective, the analysis is carried out for the average agricultural enterprises of the EU countries. The evaluation is carried out for the EU Member States from 2004 to 2022 using the Eurostat and FADN databases. A certain limitation was the Eurostat database, which does not contain complete data for all countries and years. Labour productivity was analysed using cluster analysis. It was found that there are significant differences in labour productivity of the average farm between the original EU member states and the new accession countries since 2004. The exclusion of subsidies caused a 15% decrease in labour productivity. Moreover, the findings are substantially influenced by the price level in each of the countries studied, as well as the degree of urbanisation and the share of Rural Areas in these countries.

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# 1 Introduction

The paper connects relatively autonomous considerations of agriculture as a sector of the national economy that influences the performance of the economy and rural simplicity, without which the various functions of agriculture cannot be realized. Agriculture and the countryside are seen as complements that cannot be viewed separately if sustainability aspects are to be fulfilled. Sustainability and the complementarity of agriculture and rural areas in the EU countries are two important interlinked concepts that are part of the European Union's Common Agricultural Policy (CAP).

Agriculture is a key part of the rural economy and society, but rural areas also include other aspects such as services, forestry or local business. It is, therefore, a matter of ensuring that economic policy supports not only food production and agricultural activities but also the development of other rural activities that can help to diversify the rural economy and improve living conditions in these areas.

# 2 Theoretical Background / Literature Review

For more than two decades, the relationship between agriculture and the countryside has been intensively studied. Cairol et al. (2009). This relationship can be examined in a wide range of aspects, including, among others, social, economic and environmental. Kasimis (2010), Kalantaryan et al. (2021) not only in the context of economic and social have analysed the migration process and integration in the context of rural and agriculture. Kusio et al. (2022) analysed the positive functioning of rural communities in relation to support by way of social and structural policy instruments and measures, using the example of five European rural regions.

The links between economic and environmental through the analysis of the relationship between multifunctionality and agricultural sustainability were explored by Casadevall (2016) using Eurobarometer reports. The role of environmental aspects in rural development was highlighted by Take Barbier (2025). Papadopoulos (2015) explored the promotion of the functioning of rural areas and agriculture through CAP instruments and measures. According to some studies, the public, consumers and researchers (Hart and Bas-Defossez, 2018; Lakner and Pe'er, 2018; Recanati et al., 2019) have long criticised CAP and called for a paradigm shift

towards more environmentally, socially and economically sustainable policies (Rac, Erjavec and Erjavec, 2015). Similarly, with a focus on food security, Volyk et al. (2023) examined farm competitiveness.

The increasing role of digitalisation and its impact on rural life, based on the use of rural development tools and measures, has been explored by Ferrari et al. (2022), Preston et al. (2007), Koutridi, E., & Christopoulou, O. (2023), Ma et al. (2023). A critical perspective on the use of some of these tools is offered by Prusa et al. (2022), with an emphasis on the possibilities of increasing rural resilience by harnessing its endogenous potential.

The Common Agricultural Policy (CAP) is the most important common policy of the European Union and is one of the few areas funded mainly by the European Union. Although the share of the CAP in the EU budget has decreased from 66% in 1980 to 35% in 2020 (Lillemets, Fertő and Viira, 2022), it still constitutes a significant part of total EU spending. It can, therefore, be expected to substantially impact the economic, environmental, and social aspects of agriculture and life in rural areas.

According to the most recent change to the CAP, member states are supposed to have increased subsidiarity in the planning and implementation of the CAP. Each Member State has drawn up a CAP strategic plan, which includes interventions for Pillar I (direct payments) and Pillar II (rural development). The preparation of the plan is based on quantitative and qualitative current information that will provide a thorough analysis of the current situation in the country, actively involve all related economic and social partners, and will be connected to a set of common economic and biophysical indicators defined in the regulation (Kremmydas and Tsiboukas, 2022).

### 3 Methodology

The paper has two aims. From a macroeconomic perspective, taking into account the degree of urbanisation, the aim is to assess the economic performance of selected EU countries in terms of labour productivity in rural areas and to provide a more detailed view on labour productivity in sector Agriculture, forestry and fishing. From a microeconomic perspective, the aim is to assess the economic situation of the EU countries in terms of labour productivity of average farms and the impact of CAP on the development trends in the agricultural sector as one of the foundations for the sustainability of the rural area. The examination of the broader socio-economic framework was carried out in relation to the population of rural households in each EU Member State. Furthermore, the examination focused on the analysis of a purely economic category, which is labour productivity. This was first examined as the level of gross domestic product generated in the rural area per 1 employed person in the rural area (LP\_R) and then, in more detail, this labour productivity was examined at the level of value added generated in the agricultural sector in the rural area per 1 employed person in the rural agricultural sector (LP\_RA).

The data were taken from the Eurostat database. Due to the lack of data on the share of RH in 2005 in the Netherlands, Romania and in 2020 in Sweden, these data were replaced by the closest published data. In addition, Cyprus, Malta and Luxembourg were excluded from the analysis due to missing data. The analyses examined were carried out using Statistica software.

Labour productivity (LP\_R) in rural regions was calculated as a share of GDP in million EUR (GDP) on thousand employed persons in rural areas (EPR).

$$LP_R = \frac{GDP}{EPR}$$

The other indicator is labour productivity in rural areas (LP\_RA) in the sectors of Agriculture, forestry and fishing. It was calculated as Gross value added in the sector of Agriculture, forestry, and fishing at basic prices (GVA) on thousand employed persons in Agriculture, forestry and fishing (EPRA) predominantly in rural areas.

$$LP_RA = \frac{\text{GVA}}{\text{EPRA}}$$

Tables 1 and 2 below show descriptive statistics for variables LP\_R and LP\_RA in the years 2005 and 2020.

	Descriptive Statistics LP_R						
Variable	Valid N	Mean	Minimum	Maximum	Std.Dev.		
LP_R_2005	24	36,41026	5,95765	68,7418	22,61550		
LP_R_2020	24	53,05480	14,54034	138,2938	30,53757		

Table 1: Descriptive statistics for variable LP\_R

Source: Eurostat (2025), authors calculation.

#### Table 2: Descriptive statistics for variable LP\_RA

	Descriptive Statistics (RH_LP_RA)						
Variable	Valid N	Mean	Minimum	Maximum	Std.Dev.		
LP_RA_2005	24	17,07923	2,091008	35,30056	11,88636		
LP_RA_2020	24	32,54304	4,165072	84,73684	22,67565		

Source: Eurostat (2025), authors calculation.

For the analysis of the economic results of agricultural holdings, data from the public database The Farm Accountancy Data Network (FADN) in the EU in the years 2014-2022 (2025, European Commission) was chosen. The standard output of FADN is a set of indicators (SE) - results of agricultural holdings officially published for individual types of holdings within the FADN system. The purpose of the EU methodology is to allow the evaluation and comparison of the economic results of agricultural holdings in individual EU countries according to a uniform methodology, which is not influenced by differences in tax accounting records. The following indicators were selected as the indicators to be assessed: Total labour input (AWU = annual labour unit indicating the amount of labour input, which is derived from the number of hours worked, 2000 hours = 1 AWU, SE 010); Paid labour input (AWU - SE 020); Total Outputs (TO,  $\in$  - SE 131); Total subsidies - excluding on investments (TS,  $\notin$  - SE 605); Total Utilised Agricultural Area (ha - SE 025):

$$LP = \frac{(TO + TS)}{SE}$$

The relationship of the analysed indicators with the CAP subsidy policy is demonstrated by calculating labour productivity in two variants, including and without subsidies. Based on the data, processed by cluster analysis, a multi-variable statistical method dividing the large groups of observation into smaller and more homogeneous groups could be carried out. The clustering process can be roughly divided into three categories – hierarchical, non-hierarchical and a two-stage category. Ward's method was used in this article (Rencher (2002).

### 4 Results

The average increased in both years, but much more dynamism was recorded in the LP\_RA indicator, where there was almost a 100% increase.



Figure 1: cluster analysis – variable LP\_R (2005 and 2020) Source: Eurostat (2025), authors calculation.



Figure 2: Cluster analysis – variable LP\_RA (2005 and 2020) Source: Eurostat (2025), authors calculation.

Figures Number 1 and 2 show the results of a cluster analysis examining labour productivity in rural areas across 24 European countries. Two separate analyses are shown, likely representing data from different years or using different productivity metrics. The difference in the results of the analyses probably reflects the fact that other sectors that are more productive contribute to higher productivity in (PL\_R) rural areas. There is a special structure of economic activities in rural areas, where agriculture is one of the most significantly represented sectors. Other sectors are not as strongly dependent on natural and climatic conditions.

The analyses reveal substantial heterogeneity in agricultural labour productivity across European countries. The differing clustering patterns between the two analyses underscore the importance of carefully defining and measuring productivity. The data likely reflects variations in factors such as technological advancement, agricultural practices, land quality, and government policies across the countries.



Figure 3: Cluster analysis – variable LP EU (2004 - 2022) Source: FADN (2025), authors calculation.

The expected fact is probably indicated by two main clusters (Figure Number 3), which reflect the division of EU countries according to accession to the EU – i.e., the original Member States and the newly acceding states since 2004. For further evaluation, 7 clusters were chosen, which best represent the groups of countries with

similar development of the monitored indicators and are evaluated from the most productive countries. Denmark was evaluated as a stand-alone cluster, which achieves the highest average labour productivity of about 255 thousand  $\in$  in the EU. Its number of employees measured by AWU is slightly above the EU's of 1,9, but its average revenues are the second highest in the entire EU, at 491 thousand  $\in$ , which have been growing enormously in the last 5 years or so. Denmark is the largest exporter of pork products in the EU. In addition, there is also important cattle and poultry breeding, as well as sea fishing. At the same time, cereals (wheat), potatoes, and sugar beet are grown here.

The second cluster consists of Sweden, the Netherlands, Luxembourg, and Finland, with an average value of labour productivity of about 155 thousand  $\in$ . When evaluating the sub-indicators, it is worth emphasizing that the Netherlands achieves the most total yields here, almost twice as much as the other countries in the cluster, which achieves the highest AWU, which is again about twice as high. The reason is that the Netherlands uses its land resources very intensively and, at the same time, has favourable climatic conditions that guarantee high production. The average growth rate of this group is about 5%. In the third cluster, the United Kingdom, France, Germany, and Belgium can be traced - the value of labour productivity per average enterprise is about 117 thousand  $\in$  with a growth rate of 3,5%. These countries have very balanced yield values and AWU (slightly over 2). A typical feature of the fourth cluster for Czechia and Slovakia is a significantly above-average production (Slovakia 803 thousand €, which is the highest in the EU, Czechia 442 thousand accompanied by a high AWU value (Czechia – 6,3 and Slovakia 13,5). The high production volume is due to the historical development in these countries and the preservation of the type of farms with the highest area in the EU. When converted to labour productivity, Estonia is also part of the cluster; this cluster has about 1,5 times the EU average – i.e., 71 thousand € and achieves the highest growth rate of 9,5%.

The fifth cluster is Hungary, Austria, and Ireland, which have relatively balanced values in terms of both revenues and AWU. The average productivity here is 60 thousand  $\in$ , with a growth rate of 4,8%. With an average labour productivity of about 37 thousand  $\in$  and a growth rate of 5,8%, Latvia, Italy, and Spain are in the sixth cluster. Latvia has the highest yields here (about 1,5 times higher than Italy). The last cluster, which includes the most significant number of countries, is characterized by

a mix of newly joined countries to the EU (Romania, Croatia, Poland, Slovenia, Lithuania, and Bulgaria) and original countries that have a specific position due to their natural conditions, these are island states such as Malta, Cyprus, Greece, and Portugal also fall into this group. Agricultural enterprises have a labour productivity of about 22 thousand € but a higher growth rate of about 7%. A common feature is a lower AWU value below 2 (except for Bulgaria, with 2.7 AWU, which has the highest yields).

From the point of view of AWU, it is appropriate to add an important fact typical for the area of agricultural enterprises or farms – namely, the share of paid labour. It is about 27% in the EU and is related to the historical development of the countries in question and the overall relationship to rural areas and regional policies. The highest share of paid power is held by large companies in Slovakia (92%) and in Czechia (78%). Furthermore, the share decreases by around 55%, such as Hungary, Estonia, and Denmark. On the other hand, the lowest share of paid AWU, with 10%, is in Malta, Austria, or Ireland, and the lowest of the entire EU is employed in Slovenia, with about 4%.

### 5 Discussion

In terms of labour productivity, both in the rural area as a whole and in the agricultural sector in the rural area, there has been an increase in the period under review. The dynamics of increase was more moderate in rural areas, irrespective of sectoral focus. Significant productivity increases were recorded in the agricultural sector, with the initial level of labour productivity in rural areas (53,1 thousand  $\in$ ) almost double that of agricultural productivity in rural areas (32,5 thousand  $\in$ ). It can thus be concluded that there has been a narrowing of the gap in the level of labour productivity in rural areas. Productivity is reflected in the income situation of the rural population (Shucksmith et al., 1994, Davis et al., 1997, Karlsson et al., 2005, Chmieliński and Chmielewska, 2015, Bernard, 2019).

Thus, examining the dynamics of agricultural labour productivity is crucial to understanding the development and transformation of agriculture within a country or region (Balezentis et al., 2021). Based on the 2014-2022 time series in EU countries, an average labour productivity of 49.5 thousand  $\in$  was found per average farm with a growth rate of about 4%. In determining the labour productivity

indicator in relation to the subsidy policy, productivity was adjusted for operating subsidies, which are accounted for as part of revenues. The reduction in revenues, therefore also led to a lower productivity of EUR 41,8 thousand  $\in$ . The impact of the subsidy policy was not reflected in the different cluster structures.

Many studies have addressed the issues of subsidy efficiency and overall profitability. To date, there is no common consensus on whether the economic impact of subsidies is positive or negative, mainly due to the incomparable approaches used by researchers in empirical research (Bernini & Galli, 2024). Cost-effectiveness is evaluated in a similar way as profitability (e.g. Svoboda, 2020). The impact of piecemeal approaches to rural and agricultural support is reflected in the quality of life of rural residents (Shucksmith et al., 2009; Baldwin et al., 2023).

# 6 Conclusions

Rural areas and agriculture are complementary because they form a mutually supportive and interconnected system. This relationship is important in the broader social, economic and environmental context. Agriculture has traditionally been a major producer of agricultural commodities, and for rural communities, agricultural production is often a key economic pillar that provides jobs and supports local businesses. At the same time, agriculture can contribute to maintaining the landscape by protecting it from erosion, promoting biodiversity, looking after water resources, etc.

Labour productivity on the average EU farm has risen by 50% in almost 20 years of monitoring to 75,000. The main differences are seen between the original EU member states and the newly acceded countries since 2004. The link to the Common Agricultural Policy in terms of subsidies showed a 15% reduction in productivity, but the distribution of countries using cluster analysis remained the same. The findings are substantially influenced by the price level in the only countries examined. Similarly, the observed differences are influenced by the degree of urbanisation and the share of Rural area in these countries.

#### References

- Baldwin, C., Hamerlinck, J., & McKinlay, A. (2023). Institutional support for building resilience within rural communities characterised by multifunctional land use. *Land Use Policy*, 132, 106808.
- Baležentis, T., Li, T., & Chen, X. (2021). Has agricultural labor restructuring improved agricultural labor productivity in China? A decomposition approach. *Socio-Economic Planning Sciences*, vol. 76
- Barbier, E. B. (2025). Greening agriculture for rural development. World Development, 191, 106974
- Bernard, J. (2019). Where have all the rural poor gone? Explaining the rural–urban poverty gap in European countries. *Sociologia Ruralis*, 59(3), 369-392.
- Bernini, C., & Galli, F. (2024). Economic and environmental efficiency, subsidies and spatio-temporal effects in agriculture. *Ecological Economics*, vol. 218
- Cairol, D., Coudel, E., Knickel, K., Caron, P., & Kröger, M. (2009). Multifunctionality of agriculture and rural areas as reflected in policies: The importance and relevance of the territorial view. Journal of Environmental Policy & Planning, 11(4), 269-289.
- Casadevall, RS. (2016). Between the multifunctionality and the social legitimacy of agriculture: An overview. DOCUMENTS D ANALISI GEOGRAFICA, 62(1), 161-181.
- Chmieliński, P., & Chmielewska, B. (2015). Social changes in rural areas: incomes and expenditures of rural households. Економика полопривреде, 62(4), 907-920.
- Davis, J., Mack, N., & Kirke, A. (1997). New perspectives on farm household incomes. *Journal of Rural Studies*, 13(1), 57-64.
- Erajvec, K. and Erjavec, E. (2015). Greening the CAP'–Just a fashionable justification? discourse analysis of the 2014–2020 CAP reform documents. *Food Policy*, vol. 51, 53-62.
- Ferrari, A., Bacco, M., Gaber, K., Jedlitschka, A., Hess, S., Kaipainen, J., ... & Brunori, G. (2022). Drivers, barriers and impacts of digitalisation in rural areas from the viewpoint of experts. *Information and Software Technology*, 145, 106816.
- Hart, K. and Bas-Defossez, F. (2018). CAP 2021-27: Proposals for increasing its environmental and climate ambition. Report for NABU by IEEP.
- Kalantaryan, S., Scipioni, M., Natale, F., & Alessandrini, A. (2021). Immigration and integration in rural areas and the agricultural sector: An EU perspective. *Journal of Rural Studies*, 88, 462-472.
- Karlsson, J., Pfuderer, S., & Salvioni, C. (2005). Agricultural and rural household income statistics.
- Kasimis, C. (2010). Demographic trends in rural Europe and international migration to rural areas. Agriregionieuropa, 21(6), 1-6.
- Koutridi, E., & Christopoulou, O. (2023). The importance of integrating Smart Farming Technologies into Rural Policies (Aiming at sustainable rural development)-Stakeholders' views. Smart Agricultural Technology, 4, 100206.
- Kremmydas, D. and Tsiboukas, K. (2022). Redistribution and the Abolishment of Historical Entitlements in the CAP Strategic Plans: The Case of Greece. Sustainability, 14(2), 735.
- Kusio, T., Kudełko, J., Borges, A., Delic, A., & Stroila, I. (2022). Are there any differences in rural development challenges within European countries? Social and economic contexts from EU rural leaders. *International food and agribusiness management review*, 25(5), 737-756.
- Lanker, S, Pe'eR, G. (2018). Scientists say CAP Communication "fails to address main agricultural challenges".
- Lellements, J., Fertő, I. and Virra, A. H. (2022). The socioeconomic impacts of the CAP: Systematic literature review. *Land Use Policy*, vol. 114.
- Ma, W., McKay, A., Rahut, D. B., & Sonobe, T. (2023). An introduction to rural and agricultural development in the digital age. *Review of development economics*, 27(3), 1273-1286.
- Papadopoulos, A. G. (2015). The impact of the CAP on agriculture and rural areas of EU member states. Agrarian South: Journal of Political Economy, 4(1), 22-53.
- Preston, P., Cawley, A., & Metykova, M. (2007). Broadband and rural areas in the EU: From technology to applications and use. *Telecommunications Policy*, 31(6-7), 389-400.

Průša, J., Konečný, O., Hrabák, J., & Michal, Lošťák. (2022). Beyond the story of the LEADER projects: Are organic farmers actors of multifunctionality and rural development?. Land Use Policy, 116, 106046.

Rencher, A. C. (2002). Methods of Multivariate Analysis (2nd ed.). Hoboken: Wiley.

- Shucksmith, M., Cameron, S., Merridew, T., & Pichler, F. (2009). Urban–rural differences in quality of life across the European Union. Regional Studies, 43(10), 1275-1289.
- Shucksmith, M., Chapman, P., Clark, G., & Black, S. (1994). Social welfare in rural Europe. Journal of Rural Studies, 10(4), 343-356.
- Svoboda, J., Lososová, J., & Zdeněk, R. (2020). Analysis of costs and their effectiveness in the EU agrarian sector. Custos e @gronegócio, vol. 16 (1), 151 – 173.
- Volyk, S., Kukhar, O., & Bril, M. (2023). Management of the agricultural enterprises' competetiveness in the context of food security. *Baltic Journal of Economic Studies*, 9(4), 88-95.