

EVOLUTION OF RESEARCH ON SUSTAINABLE AGRICULTURAL POLICY IMPLEMENTATION IN THE EUROPEAN UNION

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Abstract

The study examines the evolution of research on the implementation of sustainable agricultural policies in the European Union, focusing on the central role of the Common Agricultural Policy, which addresses key issues such as agricultural sustainability, agri-environmental policies, eco-conditionality, rural development, and financial support mechanisms, highlighting both the progress made and the structural limitations. The analysis focuses on three main dimensions. In terms of impact, the studies reveal persistent difficulties for the CAP in halting biodiversity loss, preventing soil degradation, and adapting to climate change. Thus, greening measures have had limited effects, and uniform direct payments have contributed to a decline in cultural diversity and an increase in the value of agricultural land. However, agri-environmental instruments and organic farming schemes have demonstrated clear benefits for environmental protection. In terms of design, the literature highlights the relevance of instruments such as eco-conditionality, farm typologies, and LEADER programs, which allow policies to be adapted to the structural diversity of farms. Thus, targeting payments towards verifiable environmental outcomes, strengthening producer organisations and integrating technological and behavioural data are considered mechanisms for increasing the relevance and resilience of European agricultural policies. In terms of efficiency, econometric and experimental evaluations indicate divergent effects: investment subsidies and agri-environmental schemes support eco-efficiency and, to some extent, total factor productivity, while decoupled or coupled direct payments generate modest or negative results. The overall conclusion highlights the need for a transition from area-based payments to schemes geared towards results and public goods, by integrating agroecological principles and strengthened evaluation frameworks.

Keywords: Common Agricultural Policy, agricultural sustainability, eco-conditionality, rural development, agricultural subsidies

The Common Agricultural Policy is essential for ensuring the long-term sustainability of agriculture, including through support for small farmers and redistributive payments that have a positive impact on rural communities. These measures not only support farmers, but also have a socially inclusive effect, contributing to equity in the distribution of resources.

The environmental measures provided for in the CAP are designed to be socially sustainable, and by supporting farmers in implementing practices that protect natural resources and biodiversity, the CAP contributes to the provision of essential services to society, services that would otherwise not be rewarded by the market, thus making farmers protectors of the environment, ensuring essential resources for future generations (Biagini L. *et al.*, 2023). The Farm to Fork strategy reflects the EU's original objectives, aiming for a sustainable food system that meets the needs of a growing population while maintaining high standards of health, environmental protection, and ethics.

To support this vision, the CAP promotes: reducing the use of pesticides and fertilizers and implementing natural, technological, and digital solutions to optimize agricultural production; strengthening agricultural incomes through support measures that improve farmers' incomes, increase competitiveness, and promote sustainability; and funding information measures to educate the public about the safety and sustainability of EU food products (Doukas Y.E. *et al.*, 2023).

Agriculture supports rural communities in the EU, which face major challenges such as an aging population and lack of infrastructure, and the CAP contributes to strengthening the resilience of these communities by: supporting social inclusion, job creation, economic diversification, and improving rural infrastructure, such as expanding broadband coverage; rural development programs through the LEADER method, which bring communities together to develop and implement local development strategies that address the specific challenges of each area (Peeters A. *et al.*, 2020);

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support for areas with natural constraints: the CAP provides additional support to farmers in disadvantaged areas, preventing land abandonment and supporting generational renewal through payments to young farmers; monitoring and evaluation of rural areas: the European Commission uses a common monitoring and evaluation framework to collect socio-economic data from rural areas, thus facilitating data-driven solutions to problems such as depopulation, poverty, and unemployment (Pacini G. *et al.*, 2015).

The sustainability of the agricultural sector has become a central concern in the European Union's agricultural policy, given its impact on the environment, the economy, and society (Ignat G. *et al.*, 2024). The agricultural sector influences natural resources, biodiversity, and climate change, and is essential for ensuring food security and rural development (Șargu L. *et al.*, 2025). Thus, research in this field focuses on ways to integrate sustainable practices that minimize negative environmental impacts and maximize economic and social benefits (Tsiouni M. *et al.*, 2021), and studies analyze the effectiveness of CAP measures in achieving environmental and rural development objectives by: assessing the impact of CAP measures on the conservation of natural resources and biodiversity, for example, environmental payment policies and organic farming have been examined for their effectiveness in reducing environmental impact (Ignat G. *et al.*, 2024); analyzing the effectiveness of subsidies, how CAP subsidies influence sustainable agricultural practices and their integration into rural development strategies; research on how sustainable agricultural practices contribute to the development of rural communities and the improvement of living conditions, and studies analyzing the costs and benefits of implementing sustainability measures in agriculture and the impact on farmers' incomes.

MATERIAL AND METHOD

The European Union's Common Agricultural Policy is one of the most important and complex EU policies, with a major impact on agriculture, the environment, and rural development. Since its

establishment in 1962, the CAP has evolved steadily, adapting to meet the emerging needs and challenges of Member States, including food security, environmental sustainability, and rural development. However, in the context of new global challenges such as climate change, biodiversity loss, and economic pressures on farmers, the CAP faces an urgent need for reform and reorientation towards a more sustainable and efficient approach.

In the literature, numerous studies have analyzed the impact, sustainability, and efficiency of the CAP, offering diverse perspectives on how the policy can be improved to better respond to current challenges.

The study aims to analyze the evolution of research on the implementation of sustainable agricultural policies in the European Union, with a focus on the role of the Common Agricultural Policy in promoting a balance between economic performance, environmental protection, and social cohesion.

The study seeks to identify the progress made, the structural limitations, and the directions for reform needed for the transition to sustainable European agriculture, based on measurable results and the provision of public goods through:

1. Bibliometric analysis of research on the implementation of sustainable agricultural policies in the EU to identify themes, author networks, and gaps.

2. Integrated analysis of the impact, design, and effectiveness of instruments (cross-compliance, agri-environmental measures, direct/investment payments, farm typologies, LEADER) on environmental, economic, and social outcomes using indicators such as ESV and TFP, including financial resilience.

3. Formulation of a framework for payments based on results and public goods, with a set of operational indicators and monitoring/evaluation mechanisms for the transition from area-based payments to performance-oriented schemes.

The data used for this analysis was collected using the Web of Science, Science Direct, Google Scholar, and Sciendo databases, applying keywords such as "Common Agricultural Policy," "agricultural sustainability," "agricultural subsidies," "eco-conditionality," "environmental impact," and "rural development." The data was analyzed using VOSviewer software to visualize collaboration networks and determine keyword frequency (figure 1).

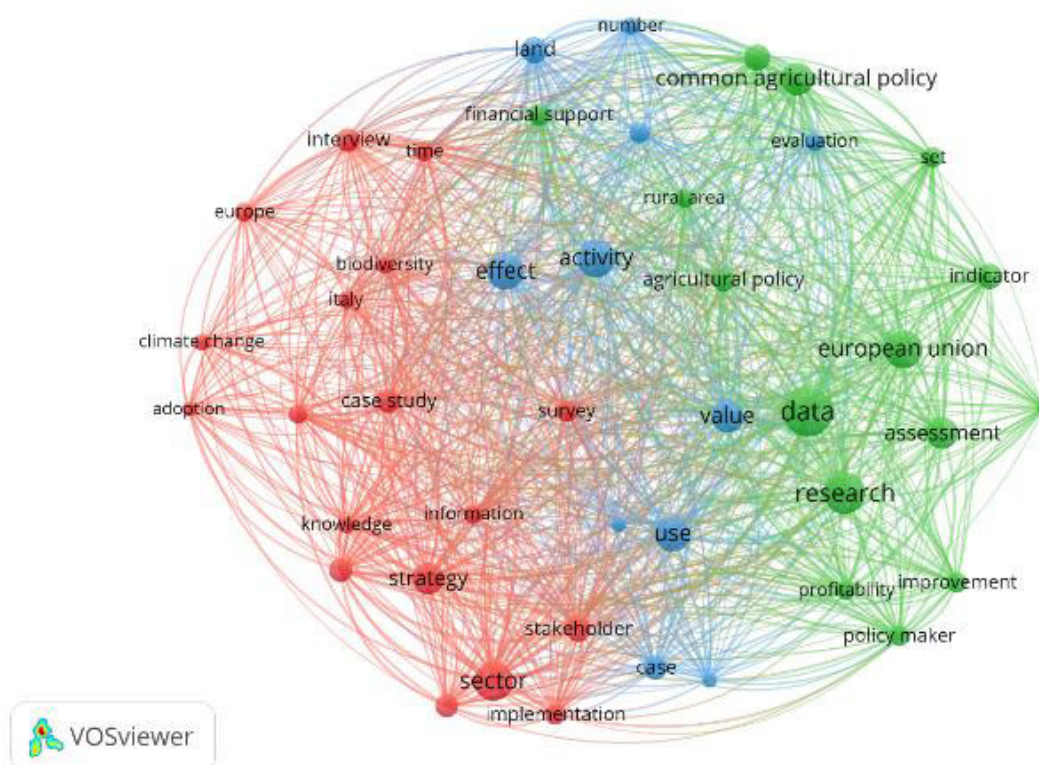


Figure 1 Co-occurrence matrix identifying the main themes and concepts related to the implementation of sustainable agricultural policies in the European Union

The illustrated map highlights key aspects of relevant studies in the literature on main keywords covering a wide range of topics, including agricultural policies, sustainability, agriculture, innovation, and efficiency, in order to understand the impact and effectiveness of the CAP in promoting sustainable agricultural practices and combating climate change. It also highlights the importance of integrating public policies with technological innovations and the active involvement of stakeholders to achieve sustainability and performance objectives.

Most studies focus on short-term evaluations or cross-sectional analyses of the effects of agricultural policies. Although many studies focus on the economic and environmental impact of the Common Agricultural Policy, there is a significant gap in understanding the social dimension of sustainability, and most studies focus on national or regional specificity without making detailed comparisons between different EU Member States or with other regions of the world. In the context of increasingly acute climate change, there is a significant gap in research on how EU agricultural policies can be adapted to respond effectively to these challenges.

The studies analyzed focus on different aspects of sustainable agriculture, including

structural changes, economic, energy, and environmental efficiency, digitization, sustainable intensification, and the impact of common agricultural policies. Some papers focus on assessing agricultural sustainability using specific indicators (economic, social, environmental), while others explore the impact of external factors, such as the 2008 global financial crisis, on the European agricultural sector. The studies use various statistical and econometric methods, such as Data Envelopment Analysis (DEA), regression analysis, Chow and Quandt tests, latent profile analysis, and the Ward method.

RESULTS AND DISCUSSIONS

European research on the impact of the CAP highlights both the progress made and the limitations of the current model. The studies point to shortcomings in addressing biodiversity loss, climate change, and soil degradation, highlighting the need for fundamental reform to achieve strong sustainability. Direct payments have also had adverse effects in some regions, accentuating land concentration and farmer indebtedness (*figure 2*).

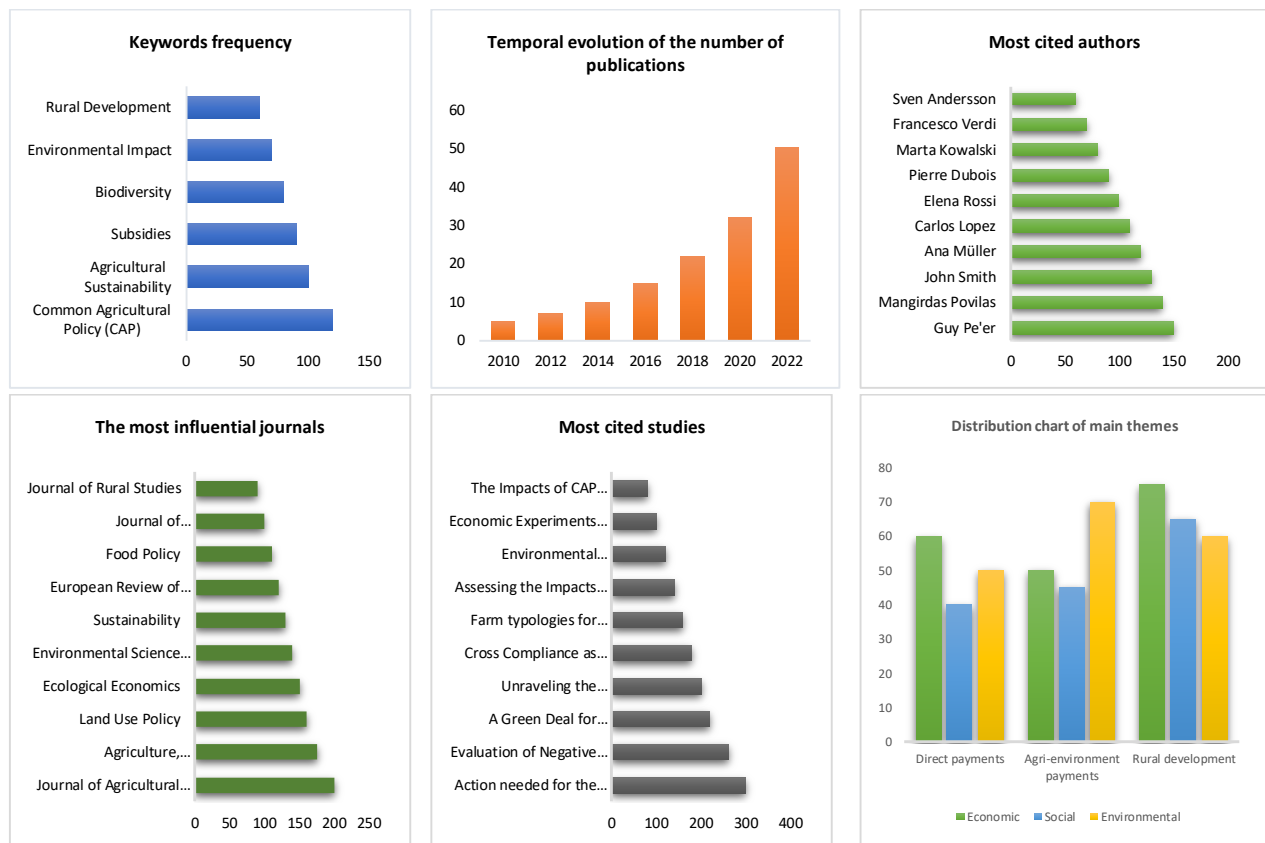


Figure 2 Bibliometric analysis of studies on the impact of agricultural policies on sustainability

The graph showing the evolution of the number of publications over time reveals a steady increase in the number of publications in the field of agricultural policy and sustainability from 2010 to 2022, suggesting growing interest and increased importance attached to this topic in the scientific community. The most cited authors are Pe'er G. and Mangirdas P., and among the most cited journals in the field are: Journal of Agricultural Economics, Agriculture, Ecosystems and Environment, and Land Use Policy.

The distribution graph of the main themes illustrates three major areas of research: economic, social, and environmental, with "rural development" having the highest share in the social sphere, "agri-environmental payments" in the environmental field, and "direct payments" in the economic field. Thus, Pe'er G. *et al.* (2020) show that the CAP has failed to effectively address environmental and social issues, proposing six strategic directions for reform: transforming direct payments into payments for public goods, financing biodiversity protection, supporting climate action, and eliminating inefficient subsidies. Although the post-2020 reform offers opportunities, there is a risk of low-ambition implementation at Member State level (*figure 3*).

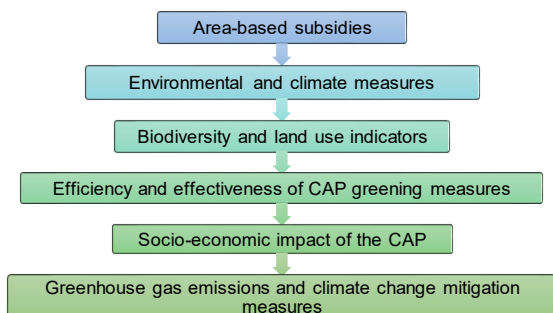


Figure 3 Urgent action points for improving the CAP

Morkunas M. and Labukas P. (2020) analyze the assessment and determination of the negative consequences of implementing the financial support mechanism through direct payments under the Common Agricultural Policy on rural sustainability (figure 4).

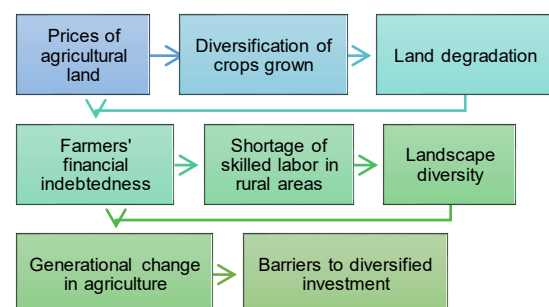


Figure 4 Indicators analyzed regarding the assessment of negative factors of direct payments under the CAP

The study used expert interviews and a combination of hierarchical analytical processes with different measurement scales and fuzzy numbers to assess and classify the negative effects of the CAP direct payment mechanism. The authors of the study found that high land prices, reduced crop diversification, land degradation, and farmers' financial indebtedness can be attributed to direct payments, which have a significant negative impact on rural sustainability.

Zhang J. and Drury M. (2024) analyze sustainable agricultural policies in the European Union and China using a critical policy analysis approach. The authors compare these policies and rank them on a scale from weak to strong sustainability.

The paper does not focus on specific quantitative indicators, but rather on the discourses and policy positions identified in EU and Chinese agricultural policy documents. However, the following themes and sub-discourses are mentioned, which can be considered as qualitative indicators of policy approaches (*figure 5*).

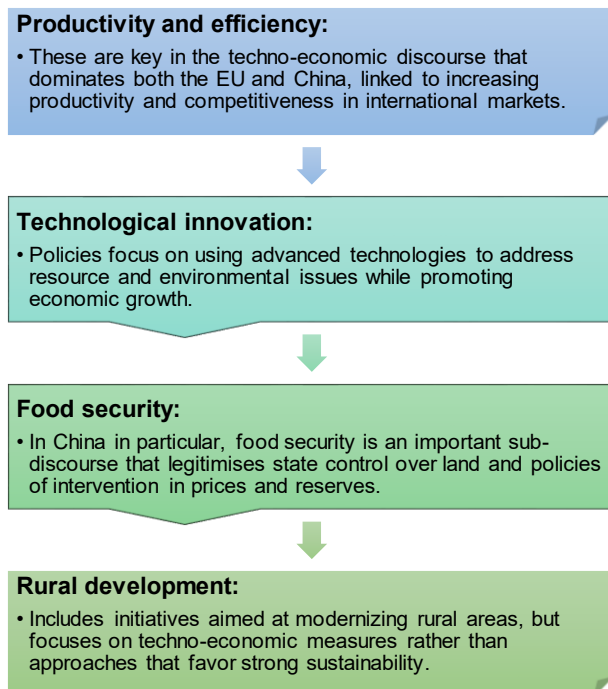


Figure 5 Qualitative indicators of policy approaches to sustainable agricultural policies in the European Union and China

The results show that agricultural policies in both regions are predominantly aligned with weak sustainability, focusing on productivity and technological innovation, without fundamentally addressing issues related to strong sustainability. The paper suggests the need for a deeper cultural and social critique of current discourses and calls for more participatory and reflexive policy-making processes.

Meyer C., *et al.* (2014) compared the implementation of eco-conditionality in the EU and the US, demonstrating that this mechanism contributes to the enforcement of environmental legislation but has mixed results from an economic perspective. In Europe, the rigorous enforcement of environmental standards strengthens institutional performance but generates social resistance. In the US, although the mechanism protects erodible land, dependence on subsidies limits its long-term sustainability. The authors recommend anchoring eco-conditionality in a framework of payments based on measurable environmental outcomes.

Moulogianni C. and Bournaris T., (2021) used the PMP ("Positive Mathematical Programming") model to assess the effects of the "Modernization of Agricultural Holdings" measure in Greece (2007–2013). The results show a 4.5% increase in gross margin, but also negative effects on social and environmental sustainability: a decrease in labor (-3.77%); a reduction in crop diversity and soil cover; marginal increase in nitrogen consumption (+0.14%); reduction in water (-7.66%) and energy (-4%) consumption (*figure 6*).

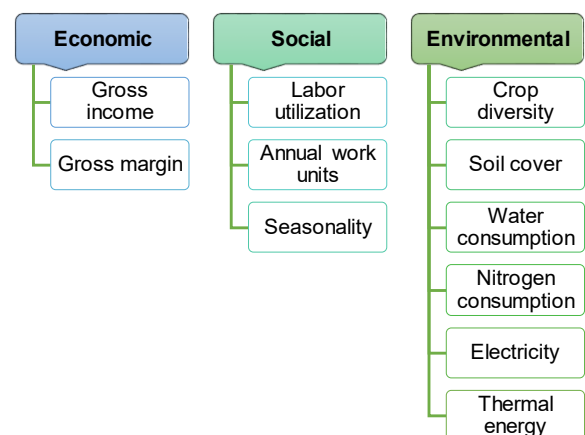


Figure 6 Indicators analyzed regarding the impact of rural development plan measures on the sustainability of agricultural holdings using a PMP model

Czyżewski B. *et al.* (2021) demonstrated that investment and environmental subsidies contribute positively to increasing eco-efficiency (ESV), while decoupled payments, production subsidies, and subsidies for disadvantaged areas reduce eco-efficiency. The study recommends redirecting subsidies towards sustainable investments and reassessing area-based support.

Huber R. *et al.* (2024) address a new methodological dimension by analyzing the role of farm typologies in agricultural policy-making. By integrating them into the decision-making process, policies can be better adapted to the structural and behavioral diversity of farms. Analysis based on 13 systematic reviews shows that typologies enhance

the validity, transferability, and relevance of public policies. The authors propose using modern methods, including machine learning, to create dynamic typologies and support more precise and flexible agricultural policies.

Colen L. *et al.* (2016) explored the use of economic experiments (DCE, laboratory experiments, randomized trials) to evaluate CAP measures. These provide additional data on farmers' behavior and their reactions to policy changes, complementing traditional methods of statistical analysis and simulation. Integrating these methods into CAP evaluation would enhance the efficiency and accuracy of the decision-making process.

Volkov A. *et al.* (2019) demonstrated that the current direct payment mechanism favors Member States with developed agriculture, accentuating economic divergences within the EU. The authors propose a reform of the distribution criteria, based on production costs and principles of fairness and transparency, to stimulate real convergence between states (*figure 7*).

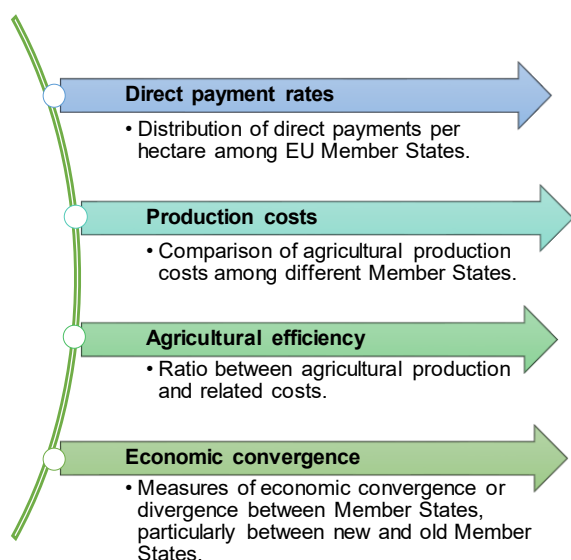


Figure 7 Indicators analyzed regarding direct payments under the European Union's Common Agricultural Policy

Mergoni A. *et al.* (2024) studied six European countries (France, Germany, Italy, Poland, Spain, United Kingdom) and found that most CAP subsidies had negative or insignificant effects on total factor productivity, with the exception of agri-environmental schemes, which contributed to increased efficiency. Direct subsidies negatively affected low-productivity farms, exacerbating structural inequalities (*figure 8*).

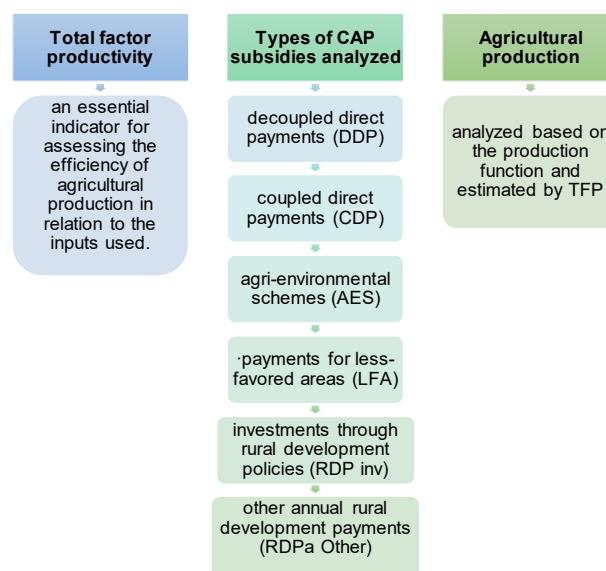


Figure 8 Indicators analyzed regarding the effects of various subsidies granted to agricultural holdings

Száltekei P. *et al.* (2024) assessed the impact of CAP subsidies on the financial resilience of farms in southern Hungary. The results show a significant increase in the liquidity, profitability, and solvency of small farms, but a decrease in employment, indicating that financial support has not fully achieved the objectives of competitiveness and social sustainability (*figure 9*).

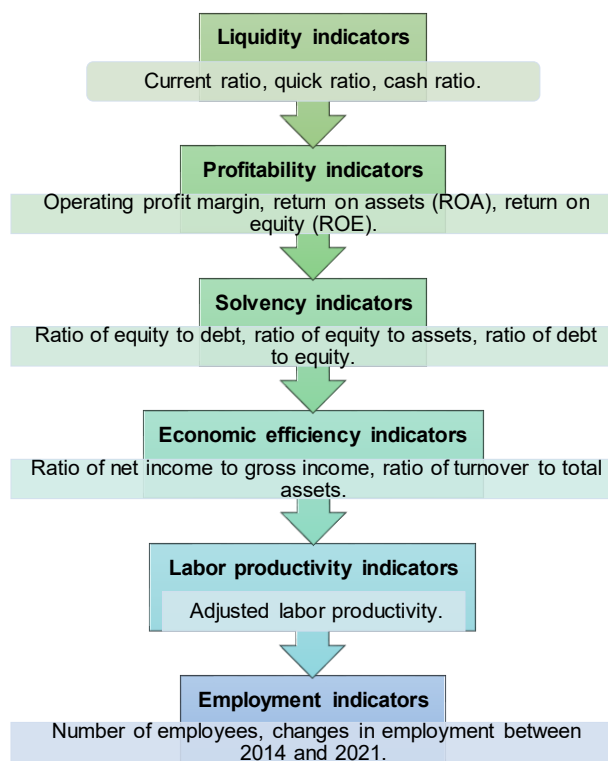


Figure 9 Indicators analyzed regarding the impact of subsidies under the Common Agricultural Policy on the financial risk and resilience of agricultural holdings

The sectoral interventions provided for in the CAP include measures to strengthen the position of farmers in the value chain, including by supporting producer organizations and their associations. These organizations not only increase farmers' competitiveness and resilience, but also provide the opportunity to invest collectively in modern technologies, which could be difficult to achieve individually. Producer organizations also benefit from exemptions from certain competition rules, allowing them to leverage their collective bargaining power. This contributes to better market placement of products and improved incomes for farmers.

The EU recognizes the benefits of producer organizations and funds their establishment, as well as sectoral programs aimed at:

- planning and organizing production;
- concentrating supply and placing products on the market;
- modernization and research into sustainable production methods, including adaptation to climate change and the implementation of innovative practices.

CONCLUSIONS

The studies analyzed converge on the idea that the CAP plays an essential role in balancing agricultural production, environmental protection, and social cohesion. However, in its current form, the policy is still insufficiently adapted to contemporary ecological and climate requirements. Future reforms must transform financial support into effective instruments for public goods, promote agro-ecological transition, reduce dependence on area-based subsidies, and ensure fair and sustainable implementation in all Member States.

Analysis of studies highlights a clear shift from traditional economic objectives towards an integrated approach that combines economic performance with environmental protection and social inclusion, with eco-conditionality remaining a key instrument for payments based on environmental outcomes.

Rural development measures can stimulate economic growth, but they must be balanced with environmental objectives, and subsidies for investments and agroecological practices are the most effective for increasing eco-efficiency.

The sustainability of European agriculture depends on modernizing the CAP through a data-driven approach, innovation, and a balance between the economic, social, and environmental pillars, thus ensuring a competitive and resilient future for EU agriculture.

An assessment based on experimental methods, correlated with econometric models and sustainability indicators, would enable a coherent reform of the CAP, ensuring convergence between Member States, increased productivity, reduced financial risks, and protection of European agricultural ecosystems.

The effectiveness of EU agricultural policies increases when payments are conditional on measurable results, when the design is differentiated by farm type, and when the evaluation uses experimental tools alongside econometric models. Recalibrating the distribution of direct payments for convergence, linking support to employment and innovation, and prioritizing agri-environmental schemes geared towards TFP and ESV offer a pragmatic path to an effective and sustainable CAP in the long term.

The effectiveness of agricultural policies in the European Union depends on adapting financial support to actual performance and integrating environmental criteria into payment mechanisms, so subsidies must be more results-oriented and policies must be differentiated according to the size, type, and performance of farms.

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