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Technical efficiency in different specialised EU farms and role of CAP subsidies

Nicola Galluzzo

Former Association of Geographical and Economic Studies in Rural Areas – Rieti, Italy

E-mail: asgear@libero.it

<https://orcid.org/0000-0003-4674-0621>

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Abstract: This research provides a rigorous evaluation of technical efficiency within the European Union's agricultural sector, assessing the impact of Common Agricultural Policy subsidies between 2004 and 2023. Utilising harmonised microeconomic data from the Farm Accountancy Data Network, the assessment of technical efficiency has used a non-parametric input-oriented approach, such as Data Envelopment Analysis, to benchmark across the EU-27 the role of different subsidies allocated by the CAP in eight distinct farming typologies. Results reveal a moderate technical efficiency of 0.4855, which rises to 0.5112 when CAP support is integrated. Direct payments under pillar I are identified as the primary drivers of this shift, whereas Rural Development Programme payments and environmental payments exhibit marginal impacts on the technical frontier.

Keywords: Pillar I; Less Favoured Areas payments; FADN; Rural Development Programme subsidies; type of farming

1. INTRODUCTION

Agriculture remains a strategic pillar of the European Union (EU) economy, serving as the primary guarantor of food security while acting as a critical agent for sustainable development, environmental preservation and economic growth in rural areas (Rusielik, 2025). The EU primary sector is characterised by immense structural and regional diversity, spanning from highly intensive farms in Western Europe to smaller, family-run farms in Central and Eastern regions. This structural divergence in productive factors, particularly land, often limits farm development and technical efficiency (Bartolini and Viaggi, 2013; Galluzzo, 2020). Significant imbalances between EU Member States persist. The specific effects that total CAP subsidies have had on technical inefficiency in EU countries were different (Galluzzo, 2023; Garrone et al., 2019; Minviel and Latruffe, 2017; Baráth et al.,

2018; 2020; Minviel and De Witte, 2017; Latruffe and Desjeux, 2016).

Such a structural bifurcation, particularly regarding the distribution and quality of productive factors like land, often imposes severe constraints on farm development and overall technical efficiency in EU farms (Bartolini and Viaggi, 2013; Galluzzo, 2020). These systemic imbalances between European Union countries have led to significant academic interest in how Common Agricultural Policy (CAP) subsidies interact with farm-level performance. Recent research suggests that total CAP subsidies have exerted specific and often divergent effects on technical inefficiency across different jurisdictions (Galluzzo, 2023; Pastusiak et al., 2021; Garrone et al., 2019; Minviel and Latruffe, 2017; Latruffe et al., 2017; Baráth et al., 2018; 2020; Latruffe and Desjeux, 2016). Consequently, understanding the drivers of technical efficiency (TE), defined as the capac-

ity of a production unit to generate the maximum potential output from a given set of inputs, in an output-oriented approach, or vice versa in the input-oriented model to minimize the input used, is paramount for future policy calibration (Cesaro et al., 2009).

The impact of CAP subsidies on TE is a complex issue with conflicting evidence. A disincentive effect has been observed in some studies, where reliance on decoupled direct payments reduces the motivation for managerial effort and input optimisation (Garrone et al., 2019; Minviel and Latruffe, 2017; Minviel and De Witte, 2017). Conversely, other scholars argued that subsidies provide the capital pivotal for modernisation and the adoption of productivity-enhancing technologies, particularly in capital-constrained regions (Rusielik, 2025; Cesaro et al., 2009).

Research indicates that these variations in the configuration of input, especially land, often act as a bottleneck for technical efficiency and long-term development with significant effects on productivity (Bartolini and Viaggi, 2013; Galluzzo, 2020; 2023). Land is not merely a passive input; its availability, tenure status, and fragmentation level dictate the degree to which a farm is able to adopt modern machinery and other productive factors or implement efficient crop rotations. When land markets are rigid or structural financial supports are misaligned, the ability of farms to reach their maximum potential output is significantly hampered, leading to persistent inefficiencies (Galluzzo, 2020; 2023).

The impact of CAP subsidies on technical efficiency remains one of the most debated topics in agricultural economics, with empirical evidence presenting a conflicted narrative and mixed, unclear effects (Galluzzo, 2020; 2023; Bonfiglio et al., 2020; Garrone et al., 2019; Minviel and Latruffe, 2017; Baráth et al., 2018; 2020; Minviel and De Witte, 2017; Latruffe and Desjeux, 2016).

On one hand, some studies point toward a disincentive effect on TE (Garrone et al., 2019; Minviel and De Witte, 2017; Minviel and Latruffe, 2017). This theory suggests that a heavy reliance on decoupled direct payments and subsidies that are not tied to specific production levels might

inadvertently reduce the motivation for rigorous managerial effort and the optimisation of inputs (Minviel and De Witte, 2017; Minviel and Latruffe, 2017). When a substantial portion of a farm's income is guaranteed regardless of market performance, the pressure to optimise resources or seek out marginal gains in productivity could diminish. In these instances, subsidies may foster an environment where efficiency becomes secondary to the administrative task of securing and maintaining subsidy eligibility (Garrone et al., 2019). This phenomenon is particularly noted in studies where high subsidy dependence correlates with increased technical inefficiency.

On the other hand, a competing school of thought argues that CAP subsidies are essential for overcoming capital constraints, particularly in less-developed or transitioning agricultural regions (Rusielik, 2025; Galluzzo, 2020; 2023; Cesaro et al., 2009). In many parts of the EU, farmers face significant barriers to accessing credit for large-scale investments. In this context, subsidies provide the necessary working capital for modernisation and the adoption of productivity-enhancing technologies (Rusielik, 2025). By mitigating risk and providing a financial cushion, CAP financial supports can enable the transition to more sustainable and efficient production methods that would otherwise be financially unfeasible (Cesaro et al., 2009).

The conflicting evidence regarding CAP subsidies suggests that their effect is not uniform but is instead mediated by many different variables, such as the socio-economic and structural context of the Member State in question and farm-specific features such as land capital, assets, and specific costs. In regions where farms are already operating near the efficiency frontier, additional subsidies may indeed produce a disincentive effect. However, in regions where the technical efficiency gap is large due to historical under-investment or land fragmentation, subsidies can act as a vital catalyst for catching up (Rusielik, 2025; Galluzzo, 2020; 2022; 2023).

The significant imbalances observed between EU member states underscore the need for a more tailored approach to agricultural policy and the

specific needs of different types of farming (Galluzzo, 2023). If the purpose of the CAP is to enhance the technical efficiency of the sector while simultaneously meeting environmental and social objectives, the subsidy model might require further refinement in order to account for different EU agricultural features. Policies that incentivise the adoption of specific technologies or that are tied to structural reforms, such as land consolidation, might prove more effective at reducing inefficiency than broad-based income support (Bartolini and Viaggi, 2013; Latruffe et al., 2017; Bonfiglio et al., 2020; Galluzzo, 2020).

The duality of subsidies, acting both as a potential barrier to managerial excellence and as a crucial vehicle for technological modernisation, requires careful consideration by policymakers (Minviel and De Witte, 2017; Latruffe et al., 2017; Minviel and Latruffe, 2017; Garrone et al., 2019; Bonfiglio et al., 2020; Galluzzo, 2020; Rusielik, 2025). Addressing the structural imbalances related to land and productive factors has to remain a priority if the EU is to foster a primary sector that is both globally competitive and domestically sustainable (Galluzzo, 2020). Future research should continue to focus on the nuanced ways in which regional contexts alter the efficiency outcomes of policy interventions, ensuring that the CAP remains a tool for progress.

2. AIM OF THE RESEARCH

The principal purpose of this research was to evaluate the extent to which subsidies allocated through the Common Agricultural Policy affected the technical efficiency of European Union farms, utilising a non-parametric approach.

The research utilised a longitudinal dataset from the Farm Accountancy Data Network (FADN) in all EU countries spanning the period 2004 – 2023. To ascertain which CAP interventions fostered improvements in technical efficiency, various funding streams from both the first and second pillars were examined. The analysis was conducted on a stratified sample, categorised by farm specialisation in order to assess what

type of farming and what sort of CAP subsidies have affected technical efficiency.

3. METHODOLOGY

The European agricultural sector stands at a crossroads, balancing its role as a provider of public goods with the economic necessity of technical efficiency at the farm level. As this discussion has highlighted, the relationship between CAP subsidies and technical efficiency is multifaceted and deeply influenced by EU regional structural characteristics and farm features. The estimation of TE by a quantitative approach provides a sophisticated lens through which to view these dynamics; the empirical reality remains complex (Galluzzo, 2023).

In assessing the performance of European agriculture in a sample of farms, the selection of an appropriate theoretical and analytical framework is critical.

The scientific measurement of productive efficiency originated with the seminal work of Farrell (1957), who introduced the concept of frontier production functions to replace simple average performance metrics (Cesaro et al., 2009). The estimation of technical efficiency can use two different approaches (Galluzzo, 2020; 2022; 2023): a parametric approach, called Stochastic Frontier Analysis (SFA), and a non-parametric or deterministic approach, namely Data Envelopment Analysis or DEA (Farrell, 1957; Charnes et al., 1978; Banker et al., 1984; 1988; Battese and Coelli, 1992; 1995; Lovell, 1993; Coelli et al., 2005; Cooper et al., 2007; Kumbhakar et al., 2015; Galluzzo, 2020; 2022).

Methodologically, Data Envelopment Analysis has emerged as a robust, non-parametric tool for benchmarking the performance of farms without the necessity of assuming a rigid functional form (Galluzzo, 2023). Unlike parametric methods, such as Stochastic Frontier Analysis, DEA allows for a more flexible interpretation of the production frontier, and it does not require *a priori* constraints and strict methodological assumptions (Battese and Coelli, 1992; Bravo-Ureta and Pinheiro,

1993; Coelli et al., 2005). This inherent flexibility is particularly advantageous when examining the EU's agricultural farms because it is possible also to include in the model multi-input and multi-output (Battese and Coelli, 1992; Galluzzo, 2020; 2022). Given the significant variations in productive scale and the diverse production systems employed across the EU countries, the DEA model is capable of accommodating a wide array of frontier boundaries (Rusielik, 2025; Nowak et al., 2015). By evaluating production units, or Decision-Making Units (DMUs) relative to an empirical frontier, DEA allows researchers to identify best-practice units and quantify the distance of inefficient units from this optimal boundary. This approach provides a nuanced view of how different regions utilise their resources, accounting for the unique constraints imposed by the type of farming and economic conditions using the Farm Accountancy Data Network dataset from 2004 to 2023 in all EU countries.

The DEA has some specific constraints because the theoretical framework assumes that n DMUs can produce a well-defined S quantity of output y using in a specific combination m input in a combination of $x \in RS^+$ (Charnes et al., 1978; Banker et al., 1984; Battese and Coelli, 1992; Coelli et al., 2005; Galluzzo, 2022).

As proposed by Charnes et al. in 1978, the estimation of the DEA by an input-oriented approach, used in this research, the solution of a linear programming problem, aimed at minimising the level of inputs used in the production process, in the dual forms (Charnes et al., 1978; Banker et al., 1984; Battese and Coelli, 1992; Bravo-Ureta and Pinheiro, 1993; Coelli et al., 2005; Galluzzo, 2020; 2022; 2023) in formulae is:

$$\begin{aligned} \min \theta_k^c - \varepsilon(\sum_{i=1}^s S_i^- + \sum_{r=1}^m S_r^+) \\ \text{s.t. } \sum_{j=1}^n \lambda_j^c x_{ij}^c + S_i^- = \theta_0^c x_{ik}, \quad i = 1, 2, \dots, m, \\ \sum_{j=1}^n \lambda_j^c x_{ij}^c + S_i^- = \theta_0^c x_{ik}, \quad i = 1, 2, \dots, m, \\ \sum_{j=1}^n \lambda_j^c y_{ij}^c - S_r^+ = y_{rk}, \quad r = 1, 2, \dots, s, \\ \theta_k^c, \lambda_j, S_i^-, S_r^+ \geq 0 \end{aligned}$$

where λ is a semi-positive vector in R^k , θ is the level of technical efficiency, S_i^- , S_r^+ are non-negative output and input slacks.

The value of technical efficiency θ should be between 0 and 1, which is the frontier of optimal technical combinations of input-output due to a well-defined and usable technology for all farms in the FADN sample.

According to the definition of the European Commission, the FADN is an instrument established in 1965 to collect annual accountancy, production, and economic data from a representative sample of farms with the aim of assessing the income and the impact of the CAP. The EU FADN dataset used in this study was sourced from Eurostat's NUTS 2 geographical classification, which corresponds to the regional level. Technical efficiency was estimated using balanced panel data for each EU region.

The input variables used to estimate technical efficiency included land in hectares of utilised agricultural area (UAA); fixed and variable costs, the latter expressed as overhead costs; total assets; comprising both fixed and current assets and labour, measured in total working hours on farms.

To assess the impact of Common Agricultural Policy subsidies on technical efficiency, estimated via non-parametric Data Envelopment Analysis, the following six scenarios were generated using FADN data:

- Baseline: Total output excluding all CAP supports;
- Total CAP: output combined Pillar I and Pillar II payments;
- Direct Payments: Total Pillar I direct support plus total output;
- Environmental Payments: Agri-environmental supports plus total output;
- LFA Payments: total output plus CAP payments for Less Favoured Areas;
- Second Pillar: Rural Development Programme (RDP) subsidies plus total output.

For the analysis in this research has been used the software R and the package deaR (Bolós et al., 2025).

4. RESULTS AND DISCUSSION

The Common Agricultural Policy represents the most significant financial intervention in the European Union's budget, aimed at ensuring food security while promoting rural development. A central metric for assessing its success for EU farms is technical efficiency, which measures a farm's ability to maximise output relative to a specific set of inputs in the output-orientated approach or to minimize inputs in the input-orientated approach. This research critically examines the results of a Data Envelopment Analysis conducted on 13,767 observations from the Farm Account Data Network between 2004 and 2023.

By evaluating six CAP subsidy scenarios across eight EU farming sectors investigated by the FADN, this study reveals that while direct payments marginally improve mean technical efficiency scores, specific environmental and regional supports, allocated by the Rural Development Programme, often result in stagnation or slight declines in farm productivity and technical efficiency. These findings are contrasted with existing literature to explore the disincentive effect as argued in other research (Minviel and De Witte, 2017; Minviel and Latruffe, 2017; Latruffe et al., 2017; Garrone et al., 2019).

The agricultural sector in the European Union is defined by a profound structural dichotomy,

Table 1. Descriptive statistics of the estimation of the technical efficiency estimated by the DEA input-oriented model in six different scenarios since 2004 to 2023

Scenario	Obs	Mean	Std. Dev.	Min	Max
DEA baseline	13,767	0.485	0.1407	0.127	1
DEA Total CAP	13,767	0.511	0.1358	0.214	1
DEA Direct Payments	13,767	0.484	0.1401	0.126	1
DEA Environmental Payments	13,767	0.488	0.1393	0.161	1
DEA LFA Payments	13,767	0.483	0.1400	0.170	1
DEA Second Pillar	13,767	0.485	0.1388	0.197	1

Source: Elaboration on FADN dataset available on the website <https://agridata.ec.europa.eu/extensions/FSDNPublicDatabase/FSDNPublicDatabase.html>.

Table 2. Estimation of the technical efficiency (TE) estimated by the DEA input-oriented model in six scenarios since 2004 to 2023 in all different type of farming

Type of farming	DEA baseline	DEA Total CAP	DEA Direct Payments	DEA Environmental Payments	DEA LFA Payments	DEA Second Pillar
Field crops	0.472	0.504	0.468	0.474	0.467	0.468
Granivores	0.568	0.577	0.562	0.571	0.566	0.569
Horticulture	0.612	0.612	0.610	0.613	0.609	0.609
Milk	0.446	0.482	0.425	0.449	0.447	0.450
Mixed	0.453	0.489	0.440	0.456	0.451	0.453
Other grazing livestock	0.419	0.465	0.412	0.425	0.420	0.425
Other permanent crop	0.488	0.504	0.470	0.492	0.482	0.486
Wine	0.508	0.511	0.489	0.512	0.503	0.505
All type of farmings	0.485	0.511	0.484	0.488	0.483	0.485

Source: Elaboration on FADN dataset available on the website <https://agridata.ec.europa.eu/extensions/FSDNPublicDatabase/FSDNPublicDatabase.html>.

where highly intensive Western farms with wide land capital input coexist with fragmented, family-run units in Central and Eastern Europe (Rusielik, 2025) with different impacts on the technical efficiency. Within this heterogeneous agricultural and productive landscape, the Common Agricultural Policy serves as a critical, albeit controversial, instrument for socio-economic stability. Central to the debate is whether these CAP subsidies enhance or inhibit the technical efficiency in farms.

The empirical data presented in this research provides a longitudinal perspective (2004 – 2023) on how different CAP subsidies influence technical efficiency across diverse farming specializations. Broadening the technical efficiency analysis carried out in previous studies (Galluzzo, 2023; Nowak et al., 2015).

Table 1 presents the descriptive statistics for technical efficiency across six scenarios. The DEA baseline, which excludes all CAP subsidies, shows a mean technical efficiency of 0.485. This relatively low score indicates that, on average, European Union farms are operating at less than half of their potential efficiency, suggesting significant room for improvement in input management and technology adoption.

When all subsidies allocated by the first and second pillars of the CAP are integrated into the model, the mean technical efficiency rises to 0.511. Interestingly, the DEA direct payments scenario values have a lower technical efficiency mean of 0.484, confirming that direct payments remain an important tool of the observed efficiency shifts within the CAP framework. This slight increase supports the liquidity effect or modernisation hypothesis, suggesting that subsidies provide the necessary capital for farms to overcome credit constraints and invest in efficiency-enhancing technologies, as argued in previous studies (Rusielik, 2025; Garrone et al., 2019; Bonfiglio et al., 2020; Galluzzo, 2020; Cesaro et al., 2009).

However, a more critical look at the specific payment types reveals a different narrative. Environmental payments result in a technical efficiency mean of 0.488, a negligible increase from the baseline, while Less Favoured Areas (LFA)

payments actually result in a decrease in mean efficiency to 0.483. This downward trend for LFA payments suggests that support directed at geographically disadvantaged areas might act as a safety net for farms rather than a productivity driver. As noted in the literature, subsidies in mountainous and disadvantaged regions often sustain farms that would otherwise be non-viable, thereby lowering the aggregate efficiency of the sector (Galluzzo, 2020). This aligns with studies using different environmentally specific technologies (Baráth et al., 2018), while other research argues that subsidies do not influence productivity (Baráth et al., 2020) or growth because other inputs, such as social capital, are involved (Pastusiak et al., 2021).

The structural configuration of productive factors, particularly land and capital, varies wildly across farm specialization as proposed in other studies (Bartolini and Viaggi, 2013; Galluzzo, 2020; 2023; Latruffe et al., 2017; Garrone et al., 2019; Bonfiglio et al., 2020).

Horticulture farms and granivore farms exhibit the highest baseline technical efficiency scores, at 0.613 and 0.568, respectively (Tab. 2). Notably, horticulture farms show almost no change and even a slight decrease when total CAP subsidies are applied. This suggests that highly intensive, market-oriented sectors are less dependent on CAP financial support for improving their technical efficiency. For horticulture and granivore DMUs, technical efficiency is driven by market competition rather than administrative payment transfers. Conversely, other grazing livestock farms start with the lowest baseline value of technical efficiency of 0.419 but see a significant jump to 0.465 with total CAP support. Similarly, the milk farms rise from 0.446 to 0.482. These types of farming are in fact historically subsidy-dependent. The increase in technical efficiency might reflect the role of subsidies in maintaining the scale of operations in capital-intensive livestock farming, which is often hampered by high fixed costs and land capital constraints (Galluzzo, 2020).

The farms specialised in wine production maintain a stable technical efficiency around 0.51

across most scenarios, indicating a high degree of structural resilience. Field crops farms show a notable improvement from 0.472 in the baseline scenario to 0.505 when in the model the total CAP subsidies are included, likely due to the impact of direct payments on the ability to purchase high-quality inputs and other modern inputs.

The data reveals a tension between two primary economic theories regarding agricultural supports. On one hand, the disincentive effect argues that decoupled payments reduce the pressure on managers to optimise their inputs (Minviel and De Witte, 2017; Minviel and Latruffe, 2017). The fact that the mean of technical efficiency across all farm types only reaches 0.511 despite decades of financial support suggests that subsidies might foster a soft budget constraint (Garrone et al., 2019). If a significant portion of income is guaranteed regardless of output, the motivation to seek marginal gains in efficiency is diminished. This is particularly evident in the LFA scenario, where support may be subsidising inefficiency to meet social or environmental goals (Galluzzo, 2023; Minviel and Latruffe, 2017; Minviel and De Witte, 2017). On the other hand, the credit constraint hypothesis posits that in transitioning economies or regions with fragmented land capital, CAP payments are essential for the economic growth of farms (Rusielik, 2025). The data for grazing livestock, which show a modest gain under the direct payment scenario, demonstrate that without this influx of liquidity, many farms would be unable to reach the minimum scale required for efficient production (Bartolini and Viaggi, 2013).

The stability of the second pillar's results, 0.485 versus baseline 0.485, is particularly striking. The second pillar of the CAP is intended for rural development and structural reform by subsidies allocated in the framework of the Rural Development Programme. The lack of a clear efficiency gain in this second pillar scenario, or rather Rural Development Programme subsidies plus total output, suggests that these funds may be prioritising long-term sustainability or environmental stewardship over short-term technical productivity. This aligns with the broader EU

shift towards a greener CAP, where the definition of technical efficiency is expanding to include the production of public goods rather than just raw agricultural output (Rusielik, 2025).

The analysis of the FADN dataset from 2004 to 2023 underscores that CAP subsidies have a non-linear and sector-specific impact on technical efficiency. While direct payments offer a marginal boost to the average technical efficiency, they do not appear to be a panacea for the underlying structural weaknesses of European agriculture, such as land fragmentation and the ageing demographic of farmers (Galluzzo, 2020; 2023; Bartolini and Viaggi, 2013).

The findings comparing different types of farming have pointed out a disparity between market-driven farms such as horticulture farms and policy-driven sectors such as grazing livestock. For policymakers, this suggests that a one-size-fits-all approach is increasingly obsolete. Future iterations of the CAP should perhaps move away from broad income support, which risks entrenching inefficiency, towards targeted investments in digitalisation and land consolidation (Nowak et al., 2015). Furthermore, the stagnant efficiency scores under environmental and LFA payment scenarios suggest a trade-off. If the EU wishes to maintain farming in disadvantaged areas or achieve high environmental standards, it has to accept a lower level of purely technical efficiency as the price for these public goods. As research continues to explore these dynamics, the challenge remains to balance the economic necessity of productivity with the social and ecological mandates of the 21st century (Rusielik, 2025; Galluzzo, 2023).

5. CONCLUSIONS

The longitudinal analysis of the European agricultural sector, utilizing a non-parametric Data Envelopment Analysis on 13,767 observations, reveals that European Union farms operate at a moderate level of technical efficiency under the optimal empirical frontier of production, suggesting significant structural inefficiencies in input

management and technological adoption in terms of an excess of input.

This research establishes that while the Common Agricultural Policy provides essential financial support for EU farms, it does not uniformly enhance technical efficiency. The baseline average efficiency remains moderate, and the integration of subsidies shifts the frontier only marginally. This shift is almost exclusively driven by direct payments disbursed by the CAP Pillar I, confirming their dominance in farm liquidity, whereas environmental and structural measures under the CAP Second Pillar have an effect on the technical frontier.

When total CAP subsidies are integrated, the technical efficiency rises marginally to 0.511. Notably, this improvement is almost entirely driven by direct payments, indicating that direct payments are the main driver within the observed model. Conversely, subsidies allocated in terms of less favoured areas' payments show no clear efficiency-enhancing effect.

This suggests that while direct support provides necessary liquidity, regional and environmental payments have a mixed effect on the technical efficiency.

The research highlights a profound gap within EU agriculture correlated with the productive specialization of farms and their sensitivity toward CAP subsidies, investment, and capital endowments, such as assets and land capital. Grazing livestock farms have pointed out, as subsidies are essential to maintain the scale of operations, overcome the high fixed costs, and land capital constraints that characterize livestock farming.

Enhancing competitiveness requires directed investment in infrastructure, land-use optimisation for grazing systems, and the professionalisation of management to mitigate the disincentive effect of decoupled support.

Future research should delve deeper into how regional socio-economic contexts, such as local land market rigidity and demographic ageing, alter the efficiency outcomes of policy interventions.

The proposed 2028 – 2034 National and Regional Partnership Fund reform signals a poten-

tial renationalisation of funding that could exacerbate existing internal disparities. Such fragmented CAP management risks undermining the growth of rural areas and agricultural exceptionalism. To safeguard the future of the EU primary sector, governance has to ensure that food security and environmental mandates remain harmonised rather than diluted under a new CAP funding model.

As the Common Agricultural Policy shifts toward a greener model, the definition of technical efficiency must expand. Future studies should move beyond purely technical efficiency to incorporate eco-efficiency metrics, evaluating the production of public goods as an output rather than a burden on productivity.

To enhance the competitiveness and sustainability of the EU primary sector, policymakers should consider the following recommendations: a transition from broad support to targeted investment; structural reforms and land consolidation to reduce land fragmentation while incentivizing land-use optimization; and the professionalization of management through training and advisory services, ensuring that subsidies act as a catalyst for innovation rather than a cushion for stagnation. The CAP governance has to ensure that food security and environmental objectives are prioritised. LFA, or environmental subsidies allocated, are a price for public goods able to support farms' technical efficiency.

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