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The impact of agricultural policy measures on protecting agrobiodiversity, promoting sustainable farming, and improving farmers' incomes

A desk review of experiences from Europe

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Disclaimer

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EXECUTIVE SUMMARY

This report presents the results of a desk review about the impact of agricultural policy measures implemented in Europe for the protection of agrobiodiversity, the promotion of sustainable farming, and the improvement of farmers' income. The Common Agricultural Policy or CAP (initiated in 1957) of the European Union, is by far the most influential agricultural policy. The CAP has many components and policy instruments to provide direct payments to farmers (i.e., income support), intervene in agricultural markets (regulation of prices and protection of certain production sectors), promote the greening of farming and farming landscapes, and contribute to sustainable rural development. Apart from the CAP, other European programs that focus on similar objectives include NATURA 2000 (a network of protected areas), and HORIZON 2020 (a research and innovation program).

The desk review found that among the publications analyzed, there are very few detailed studies that systematically evaluate the outcomes of CAP policy measures on the core dimensions of agrobiodiversity, income, and sustainability. Many methods are used, including modeling, but studies are difficult to compare and lack a common assessment framework.

The review concludes that, over many decades, the CAP has been instrumental in supporting farmers across Europe financially, but this has not or hardly been realized in harmony with the conservation of agrobiodiversity and the protection of the agro-environment. Scholars have argued that one of the main reasons for this shortcoming is the inadequate conceptual framework that informs the CAP, with too little attention paid to the dynamics of agrobiodiversity conservation, agroecology, and food systems (transformation). These dynamics include trade-offs between (achieving) agrobiodiversity and yield (objectives), and thus between conservation and income. A second shortcoming emerging from the desk review is the limited understanding that policy makers and implementers have of farmer decision-making, which is not only motivated by economic interests, but also by social and political factors. Many of the CAP policy measures have been criticized for not considering the complexities of farmer decision-making.

A number of recent initiatives that promote crop diversification (not CAP-supported) are reporting positive impact on both agrobiodiversity conservation and crop yield, perhaps showing a new and more effective way forward.

THE ASSIGNMENT

In China, the number one priority of agricultural policies is the provision of food security. Nevertheless, the negative impacts of conventional agriculture on soil, water, and the environment in general are obvious, and approaches to environmentally friendly and sustainable agriculture are increasingly promoted. This necessitates balancing the priority of food security with measures to protect agrobiodiversity, which raises the question of what impact these protection measures would have on agricultural yields and farmers' income.

In Europe, several measures have been introduced to protect agrobiodiversity, primarily through the Common Agricultural Policy (CAP) and through the Natura 2000 Network for natural habitats. Measures include subsidies to conserve high-diversity landscapes, promote organic farming, and reduce the use of chemical inputs, among others.

This study reviews reports and studies on the impact of these measures and summarizes the results based on the following questions:

- What agricultural and farmland biodiversity conservation (protection) projects have been implemented in Europe?
- In the case of projects that use subsidies, are the details available?
- Are research results available on the impact of agricultural biodiversity protection projects on agricultural yield and farmers' income?
- What are the effects in the short and long term (e.g., over 5 years, 10 years)?
- Have there been any post-evaluations of these projects after 5 years or longer?

The report is organized in the following sections: methodology; results (divided into several subsections concerning the Common Agricultural Policy (CAP) of the European Union and non-CAP projects); and reflections.

METHODOLOGY

Given the questions of the assignment, the desk reviewed focused on the links between policy/subsidy, the protection of agrobiodiversity, and the impact on yield and farmers' income in Europe.

In Europe, by far the largest programs that support agricultural development with subsidies/grants are the Common Agricultural Policy (started in 1957), which has a most recent budget of 387 billion EUR for 2023-2027, and the EU Horizon 2020 Research and Innovation program (2014-2020; budget 80 billion EUR) and its follow-up program, Horizon Europe (2021-2027; budget of 93.5 billion EUR), both including a programming area on biodiversity, environment, and natural resources. Thousands of initiatives (projects) have been funded under these programs, at national, subnational, and multi-country levels, with farmers as direct beneficiaries (CAP) and (mostly) indirect beneficiaries (Horizon). Projects under the new CAP Phase 2023-2027 and Horizon Europe are still ongoing and were not reviewed here (for more information about Horizon Europe, see here).

First, a literature review related to the Common Agricultural Policy of the European Union was carried out. It was based on a targeted review of scientific literature databases (CABI, Google Scholar, Web of Science, Consensus.ai). A very large body of research has accumulated on a wide range of aspects of CAP related subjects, including: agroenergy sector, agroforestry, climate change, dairy sector, ecosystem services, employment, equity, farm types and farming systems, food security, grasslands, greenhouse gas emissions, income (equity), land markets and land prices, landscapes, livestock sector, non-farm economy,

organic farming and organic sector, productivity, regional development, resilience, soils and soil fertility, tourism, viticulture, water. Among these topics, not surprisingly, the economic impact of the CAP on regions and farms in the European Union countries has received the most attention (Guth et al. 2020). However, it proved challenging to find references that explore the combined subjects of agrobiodiversity, yield, and farmers' income.

An advanced search in Google Scholar (2 December 2024) using the combination of "common agricultural policy" AND "farm income" in all fields (2000-2024) resulted in 10,400 references. The combination of "common agricultural policy" AND "farm income" AND "biodiversity" in all fields (2000-2024) resulted in 4,610 references. However, a review of the abstracts of these 4,610 references reduced this number considerably given that "(agro)biodiversity" is often included only in sections describing the CAP objectives and policy instruments, and far less in discussions of the impact of CAP on "(agro)biodiversity" and even less so on the relationship between CAP, "(agro)biodiversity", and "farmers' income."

We selected about **40 references from the 4,610 for in-depth review. Of these 40, about 20 provided detailed data and analysis of crop-level and/or farm-level biodiversity. To expand the list, additional articles were selected from the reference lists of the 40 articles (snowball method), complemented by a selection of references resulting from the prioritized lists on Consensus.ai (using the same key words as those used for the Google Scholar search).**

Among the relevant references found, several articles use ex-ante modeling and simulation (of the impact of CAP on farm income, the impact of CAP on biodiversity, and the combined impact of CAP on biodiversity and farm income) as key analytical tools (see Angileri et al. 2017, Hristov et al. 2020, Overmars et al. 2013). However, there are very few ex-post assessments, and none cover five or even 10 years.

The CAP-focused literature review was complemented by a review of the titles and abstracts of 186 **evaluation reports on specific CAP measures conducted by member states** (published between 2014-2022), many of which cover (aspects of) regional Rural Development Programs (RDPs). Measures include financial support for farm start-ups and young farmers (in the most recent CAP set at a maximum of 100,000 EUR per farm); and support for organic farming, habitat management, restoration of pastures and hay meadows, preserving and improving water quality, the delivery of farm advisory services, conservation of bird species, reducing greenhouse gas emissions and enhancing carbon sequestration, gender equality, renewable energy, and collaboration for innovation. While none of these reports focused explicitly on the conservation of crop diversity and/or farmer income (as evident from their titles and abstracts), it is possible that reference was made to these topics elsewhere in the report. The reports can be found here.

Subsidies were researched on the CAP website, but only general information was found. EU member states are responsible for determining specific subsidy amounts. Some information about CAP subsidies for organic farming in EU countries was found in an IFOAM report and presented in **Box 1** (pages 10-11); a list of all the available CAP subsidies for the Netherlands in 2025 is presented in **Box 2** (page 11).

Projects funded under **the EU Horizon 2020 Research and Innovation program** were reviewed based on the term "agrobiodiversity", resulting in 35 entries. Of these, four projects addressed relevant topics; two were included in the review: **DIVERSIFOOD** and **LIVESEED**. Two others are still underway, and no useful references were found**:** INCREASE (Intelligent Collections of Food Legumes Genetic Resources for European Agrofood Systems, 2020-2026) and SHOWCASE (SHOWCASing synergies between agriculture, biodiversity, and Ecosystem services to help farmers capitalize on native diversity, 15 EU countries, 2020-2025).

Given the limited time available, only a desk review was carried out. Interviews with knowledgeable resource persons, such as policy evaluators, would have been useful but were not feasible.

RESULTS

The Common Agricultural Policy

The Common Agricultural Policy (CAP) was introduced in 1957, a decade after World War II, as a mechanism for European integration (as formulated in the Treaty of Rome, 1957). Its aims were to attain food security, develop modern agriculture, improve the livelihoods of farmers, and stabilize food prices through common financing and regulations (e.g., direct financial support to production). In the first few decades, these objectives were achieved to a considerable extent. However, serious negative impacts, such as overproduction (e.g., milk) and environmental degradation, became increasingly evident in the 1970s and following decades.

To address these shortcomings, the CAP underwent some changes, beginning with the EU Commissioner McSharry reform in 1992, which refocused the instrument of market (product price) regulations to direct payment to farmers based on crop areas and livestock numbers. As part of the reform, import tariffs and production quotas were abolished. Direct payments were introduced instead. Agri-enviroment regulation 2078/92 provided support to farmers to reduce agro-chemicals use, shift to organic farming and less extensive farming, and more environmentally friendly use of the countryside more broadly, through agri-environmental payments, afforestation, among others (Lefebvre et al. 2015). European landscape conservation and restoration also became important objectives (Lefebvre et al. 2015).

New changes were made through the so-called Agenda 2000 reform (approved in 1999), further reducing the market support and increasing the direct payments. In 2013, another reform was introduced, this time focused on redistributing payments made both between and within member states (known as external and internal convergence).

CAP 2014-2020 (applied until 2022, after which the new CAP 2023-2027 started) aimed to increase agricultural competitiveness and production through a combination of market orientation and income support. This continued the main CAP strategy geared at increasing intensification of European agriculture although with a somewhat “greener” orientation and more attention given to the (protection of the) environment and sustainability (Fusco 2021). Since its inception, the CAP has operated with a very large budget (362.8 billion EUR for 2014-2020) and a highly comprehensive scope of components and instruments.

In its recent form, the CAP has been divided into two pillars:

- Pillar I covers two main instruments: i) direct payments granted annually directly to farmers' bank accounts, as income support, and to provide a safety net; and ii) market measures included in the single Common Market Organisation (CMO), which sets out the parameters for intervening in agricultural markets and providing sector-specific support (e.g. for fruit and vegetables, wine, olive oil, school schemes).
- CAP Pilar II-RDP: covering 19 different instruments focusing on rural development (e.g. support for small farms, young farmers, mountain areas, women in rural areas, climate change mitigation and adaptation, biodiversity and short supply chains).

It is notable that across Europe, about 80% of all financial support goes to only about 20% of the farmers, often the better-off ones. Although overall the CAP subsidies incomes improved farm income of all farm classes, the largest farms benefitted the most (while they are the least vulnerable to market fluctuations), as a detailed study about the impact in all EU countries between 2005 and 2015 demonstrated (Guth et al.

2020). These authors conclude therefore that the CAP policy failed to reduce the income gap among farms, not achieving its main social goal.

Since 2015, farmers who wish to receive direct payments from the Basic Payment Scheme (Pillar I) are obliged to fulfill the following measures: i) crop diversification; ii) maintain some farmland (at least 5%) as semi-natural habitat (known as Ecological Focus Area or EFA instrument); and iii) maintaining existing permanent grassland. These three measures are clearly biodiversity conservation focused. However, some farmers are exempted from these obligations, including small farms (less than 15ha), organic farms, farms in forest areas, and farms that use more than 75% of land to cultivate grass.

The CAP 2014-2020 (2022), despite a "greener" outlook, has been criticized for not delivering on its promises. Some authors are particularly outspoken, concluding that the CAP has failed to reverse the loss of biodiversity (let alone improve it) or markedly reduce the footprint of European agriculture on the natural resource base (Pe'er et al. 2022).

The CAP post-2023 proposes a new "Green Architecture" with a focus on income, environment, and rural population, focused on three area-related environmental instruments:

- "Enhanced conditionality"
- Agri-Environment Climate Measures (AECM) in Pillar 2
- New "Eco-schemes" in Pillar 1

Similar to AECM, Eco-schemes are voluntary for farmers, but EU Member States have much more freedom in their design. **Member States are required to invest at least 20% of Pillar 1 payments in Eco-schemes in 2023–2024, and at least 25% after 2025. The minimum share of Pillar 2 payments for environmental instruments increases from 30% currently to 35% after 2023.** In this new CAP post-2023, countries can implement and adapt CAP instruments according to national policy, aimed to making national implementation better suited to "local" conditions (Lampkin, Schwarz, and Bellon 2020).

The total CAP budget for the period 2021-2027 amounts to **386.7 billion EUR**; with 291.1 billion EUR allocated to Pillar I through the European Agricultural Guarantee Fund (EAGF), and 95.5 billion EUR allocated to Pillar II through the European Agricultural Fund for Rural Development (EAFRD), see here.

The new CAP links most of the income support for farmers to two main criteria:

- The **farmed hectares**, not the quantities produced. Farmers must respond to market demands in order to increase profit. Decoupling (delinking) payments from the quantity produced avoids overproduction.
- **Respect for the environment, plant health, and animal health and welfare**, contributing to sustainable agriculture. This was referred to as 'cross compliance' up to 2022 but has since been changed to an enhanced 'conditionality' in the CAP 2023-27. Farmers who do not comply with CAP rules may face reductions or even the complete cessation of their payments.

The CAP is implemented through **National Strategic Plans**, which contribute to strengthening rural socio-economic structures, improving farm incomes, and ensuring food security. They also drive climate action and help safeguard natural resources and enhance biodiversity. Subsidies (amounts and conditions) are detailed in these plans. They can be found here.

The CAP post-2023 is influenced by the **European Green Deal**, an overarching environmental strategy for Europe encompassing all natural resources. To support the long-term sustainability of agriculture and the environment in Europe, the new Common Agricultural Policy-post 2023 is aligned with the **EU Biodiversity**

Strategy for 2030 and the EU Farm to Fork Strategy. The goal is to support agricultural practices in which farmers are considered core actors and custodians of biodiversity.

Some authors, such as Alessandrini et al. (2024), are critical of the CAP post-2023, raising the questions: How does the 2023 CAP address the position of small farmers, and to what extent do the CAP Strategic Plans of EU Member States reflect the emphasis on small farms as a cornerstone of EU agriculture?

The following sections present i) a review of references that address CAP measures more broadly; ii) a review of country studies, divided into Eastern Europe and Western Europe.

General reviews

In their participatory stakeholder-based evaluation of the effectiveness of **11 of the CAP instruments applied to 15 case studies across Europe**, Linares Quero et al. (2022) reported very variable results. Among the overall highly rated instruments were food policies, which refer to support for the processing and marketing of organic products, the creation of producer organizations, and the promotion of short value chains and local markets; and regional development policies (the LEADER program); Research and Development/advice/training/information; and practice-based payments (notably, organic farming). Overall, CAP Pillar II instruments (e.g., practice-based payments that support concrete biodiversity conservation and sustainable use practices while also stabilizing income, such as for organic farmers) received better scores than CAP Pillar I instruments (where direct payments were assessed as not contributing to sustainable and environmentally friendly agriculture, e.g., not leading to diversification).

Despite the more positive assessment of CAP Pillar II instruments, the authors conclude that there are **serious implementation challenges**. Among these are: a lack of knowledge among farmers to implement good practices; administrative burdens combined with lack of implementation flexibility and heavy penalties for making implementation mistakes; insufficient financial compensation for losses incurred; and a lack of payment differentiation to cater for the diversity of (organic) farms. Overall, they conclude that the CAP instruments have had limited impact on the agroecology transition, largely due to the limited intentionality of the CAP in supporting this transition.

Other authors, critical of the CAP, have proposed a different approach (Lakner et al. 2016). They propose to support landscape-targeted and coordinated actions among groups of farmers, which can be implemented under Pillars I and II. This approach allows for the local targeting of management measures that can more effectively deliver public goods, going beyond the farm-based implementation of AECMs. Promising examples include the multi-actor 'coalitions' in the Netherlands. Such an approach requires longer-term contracts with groups of farmers and coalitions of actors.

Other authors (Scown, Brady, and Nicholas 2020) are also critical and conclude that **excessive CAP payments have been made to regions that would be relatively well-off anyway** (i.e., income support to highly productive farming regions). At the same time, regions where farming systems are providing high levels of public goods through more extensive (less intensive) agriculture are potentially being underremunerated for provisioning these services. Further, a substantial fraction of CAP payments supports already high-income agriculture with high GHG emissions. The authors argue that these payments could be better used (reallocated) to finance environmental and climate measures (AECMs, or the proposed post-2020 eco-schemes). In conclusion, the authors argue that a reallocation of CAP funding from Pillar I to Pillar II and across instruments is needed to achieve all CAP goals, rather than focusing solely on one goal: ensuring farm income.

Several scholars have addressed **the lack of attention paid to biodiversity** in the CAP overall (Linares Quero et al., 2022). Although some case studies on the impact of single policy instruments exist, notably on organic farming (country cases referenced by the authors include the Czech Republic, Estonia, Greece, Hungary, Italy, Poland); **however, in-depth comparative impact studies are lacking. The authors argued that this lack of attention is because** the European agricultural policy and national policies pay no or marginal attention to (the transition to) agroecology and sustainable agriculture (of which, one can argue, the conservation and sustainable use of agrobiodiversity are core elements). Agroecological transition can be defined as the development of territorial, biodiversity-based agriculture (Wezel et al. 2016).

Other authors also discuss the theory and practice of agroecology under the CAP and national policies in Europe, i.e. in France, Germany, and the United Kingdom, notably under the A**gri-Environment Schemes** (Lampkin, Schwarz, and Bellon 2020). These authors argue that there is a need for policymakers at all levels to address the systematic shortcomings of a sectoral CAP by aligning the CAP towards the principles of sustainability, multifunctionality, and public payments for public goods; the development of other policies in this direction; and a shift in production systems supported by dietary changes and the protection of natural resources.

Tyllianakis and Martin-Ortega (2021) analyzed the impact of **CAP's Agri-Environment Schemes (AES)** and concluded that these schemes appear to have had limited success in conserving biodiversity and providing environmental protection. They observed that farmer decision-making is one of the reasons (i.e. the willingness to accept compensation for the delivery of biodiversity and protection of the environment). Their analysis revealed that farmers appear willing to use AES, **with average payment per hectare being around 327 EUR**, but that this willingness is not matched by adequate contract design formats. They also observed that wealthier land managers stand to gain more than less wealthy ones by using AES. They conclude that policy instruments such as AES need better design (thinking) to capture the heterogenous landscape features and the complexity of farmer preferences.

A recent study based on experts' inputs and assessments (Pe'er et al. 2022) analyzed how the newest CAP reform (post 2023), including the introduction of the **new Eco-scheme instrument**, could tackle the biodiversity crisis (see Box 1 for some examples of current subsidies for organic farming). Their overall assessment is not positive, however, building on an earlier assessment (Pe'er and Lakner 2020). They observed that the Eco-schemes proposed by Member States in their national strategic plans differ in their ambition. Some plans include options with biodiversity benefits (e.g., expansion of landscape features), but many others support existing practices with little or no added value (e.g., support for crop rotation). Some plans may even lead to negative biodiversity impacts (e.g., supporting the replacement of existing habitats, such as species-rich grasslands or longer-term fallow land). **The authors noted that pro-diversity measures are not included, such as bonuses for improved spatial design of diversification, collective actions, multiyear implementation of results-based Eco-schemes, which could target particular crop species or habitats under threat** (Pe'er et al. 2020).

Box 1: *Examples of CAP subsidies for organic farming from 2023 onward (a few selected countries, source: IFOAM Organics Europe, 2022)*

In **Austria**, organic farmers will face a substantial increase in obligations concerning the measure for organic farming (set aside of 7% of farmland for biodiversity measures); the basic support per hectare (ha) for organic will decrease from EUR 235 per ha to EUR 205 per ha.

In **Belgium (Flanders)**, the first 0-5 ha receive a payment of EUR 200 per hectare, the next 5-20 ha receive EUR 100; above 21 ha no more support is granted. An organic farm will receive a maximum of EUR 2,500.

In **Bulgaria**, the budget for the transition to organic farming:

- basic treatment of grasslands - 106 EUR / ha (compensation rate 95%)
- cultivation of grasses and perennial forages on arable land - 137 EUR / ha (compensation rate 60.20%)
- cultivation of vegetables, special herbs, potatoes, and strawberries - 660 EUR / ha (compensation rate 25.18%)
- cultivation of other crops - 323 EUR / ha (compensation rate 56.70%)
- intensive orchards - 896 EUR / ha (compensation rate 58.80%)
- other orchards - 536 EUR / ha (compensation rate 39.10%)
- vineyards - 900 EUR / ha (compensation rate 41.45%)
- hop gardens - 900 EUR / ha (compensation rate 41.45%) In the case of growing vegetables on a total area of up to 6 ha, the subsidy rate is 680 EUR / ha.

The budget for the maintenance of organic farming:

- basic treatment of grasslands - 100 EUR / ha (compensation rate 95%)
- cultivation of grasses and perennial forages on arable land - 120 EUR / ha (compensation rate 60%)
- cultivation of vegetables, special herbs, potatoes, and strawberries - 638 EUR / ha (compensation rate 25.13%)
- cultivation of other crops - 239 EUR / ha (compensation rate 73.50%)
- intensive orchards - 850 EUR / ha (compensation rate 56%)
- other orchards - 510 EUR / ha (compensation rate 37.30%)
- vineyards - 847 EUR / ha (compensation rate 70.40%)
- hop gardens - 847 EUR / ha (compensation rate 70.40%) In the case of growing vegetables on a total area of up to 6 ha, the subsidy rate is 660 EUR / ha.

In **Finland**, subsidies are for four types of measures:

1) Soil cover: support is incentive-based EUR 30-70/ha.
2) Land lying fallow with species composition for biodiversity purpose: support is cost-based EUR 50-80/ha. The maximum area per holding is 25%. Organic farmers can choose this eco-scheme but by doing so, no organic compensation is paid (EUR160/ha) nor basic AECM support (EUR45/ha).
3) Green manure meadows: support is cost-based EUR 65-95/ha. The maximum area per holding is 25%. Organic farmers can choose this eco-scheme but by doing so no compensation is paid for the area nor basic AECM support (EUR 45/ha).
4) Land lying fallow with species composition for pollination, landscape, game feedstocks, meadow, or birds. Support is cost-based 270-330 EUR/ha. The maximum area per holding is 25%. Organic farmers can choose the measure, but then will not receive any other subsidy.

In **France**, the eco-scheme for organic farmers and the ones in conversion will be EUR 82/ha.

Box 2: *CAP subsidies in the Netherlands, tentative amounts for 2025, per ha unless stated otherwise**

Basic farm subsidy	Euro 193.00
Additional subsidy on first 40 ha	Euro 52.25
Compensation payment for Eco-measure	Euro 32.50
Eco-premium bronze	Euro 27.50
Eco-premium silver	Euro 76.50
Eco-premium gold	Euro 167.50
Extra payment young farmers	Euro 2.800/farm
Conservation of rare animal breeds	Euro 200/Large Livestock Unit

*43,000 applications were received by week 49 of 2024.

A systematic review (Ibáñez-Jiménez et al. 2022) analyzed the features of **69 selected innovative projects funded by EU Rural Development Programs in 15 (mostly western) European countries** (covering the CAP 2007-2020 period). These projects were designed and implemented in rural areas of the European Union **to facilitate the territorialized production of local foodstuffs and their sale through alternative networks,** using so-called alternative food network "instruments." Included were: geographical indications of food quality, agri-food brands, organic foods, local varieties, consumer associations, farmers' markets, farm-gate sales, supplying institutions, direct supply to local shops and restaurants, and digital platforms for the sale of local products online. Only 26% of the 69 projects promoted local agrobiodiversity.

First reflections

Based on this first part of the review, several observations can be made. **There is no doubt that, over the past several decades, CAP financial support (subsidies) to European farmers has helped to improve the income of many farmers, both in absolute and relative terms when compared to non-farm incomes.** Without CAP funds, farmers would be worse off and there would be fewer farms in Europe overall. Despite this impact, in many European countries the number of farms is decreasing, often due to economic challenges, but also in combination with other challenges, such as declining soil fertility, and youth abandoning farming. Critics of the CAP argue that, despite the substantial amount of funding, the distribution has been uneven and unequal, and, as a result, unfair.

Although (agro)biodiversity is included in its policy design, there is a general sense that the CAP (including in its newest version) **lacks a comprehensive conceptual framework that situates (agro)biodiversity (outcomes) within an agroecological and food systems theory. The CAP is also criticized for having a narrow design that does not consider the heterogeneity of landscapes and farming in Europe. In addition, CAP implementation (practice) has been criticized.** Studies reviewed in this report show that, through instruments such as the **Agri-Environment Schemes (AES)**, results have been highly mixed, from reasonably good (according to some) to very poor or failing to achieve goals altogether (according to others).

There appears to be a need for more carefully designed agriculture policy measures, such as diversification strategies at both farm and landscape levels, notably to minimize trade-offs between (agro)biodiversity and yield (Jones et al. 2023). As Jones et al. have argued, one alternative is to combine

several practices, such as intercropping and adding flower strips or integrated crop-fish systems. Critique has also been voiced about the lack of measures that support collective action at the landscape level, which is much needed to halt biodiversity loss.

Country case studies

Eastern Europe

Nastis et al. (2012) conducted a study of 63 farms in northern **Greece** to analyze farmers' choices regarding crop biodiversity under conditions of uncertainty, in the presence of agricultural support policies. Using farm-level data, the study aimed to determine whether CAP financial support for selected crops might be reducing crop biodiversity. They concluded that financial support for organic farming — specifically agricultural subsidies for cultivating organic crops —can be a double-edged sword. On one hand, organic farming is considered beneficial for enhancing agrobiodiversity. On the other hand, financial support may reduce agrobiodiversity if farmers decide it is optimal to cultivate only the few supported crops. The study shows that risk aversion leads to agrobiodiversity conservation. However, when CAP financial support is provided for selected crops, it weakens the relationship between revenue risk management and agrobiodiversity, indirectly leading to agrobiodiversity loss.

A study carried out in **Poland** investigated the outcomes of the "green" transformation of the CAP, including concerning the income inequalities between farms (Pawłowska and Grochowska 2021). The following CAP instruments were analyzed (all with a biodiversity dimension):

- Agri-environmental payments and animal welfare improvement, and support for adaptation of agricultural holdings to the EU standards
- Subsidies for increasing forest cover
- Subsidies for organic production (which were the highest subsidy given of all subsidies, increasing from max 15,820 EUR per farm in 2006 to 86,383 EUR per farm in 2011) and subsidies for sustainable agriculture and extensive permanent grassland
- Subsidies to protect endangered bird species and wildlife habitats and to conserve endangered plant and animal genetic resources in agriculture, and subsidies for soil and water protection
- Subsidies for holdings situated in Natura 2000 areas or in vulnerable areas

The research, based on data representative of Polish commercial farms from 2004 to 2019, utilized counterfactual modelling and assessment of income inequality. **The findings showed that the "green" transformation resulted in a negative impact on the income of Polish farms, but the support provided did not lead to larger income disparities among farms.** The support dedicated to environmental and climate protection did not fully compensate farmers for income losses resulting from the use of pro-environmental agricultural practices. The authors concluded that the CAP instruments do not contribute sufficiently to sustainable development because they do not support/motivate farmers to change their production standards.

Another study analyzed the crop diversity of (527) agricultural holdings in particular regions (with 150,000-800,000 inhabitants) in **Slovakia** and identified the impact of CAP payments on the crop diversity of these agricultural holdings, based on 2015-2016 farm data (Lazíková et al. 2019). The econometric analysis revealed that Single Area Payment Scheme (SAPS) payments had a negative effect on crop diversity, while payments for areas facing natural constraints, and animal welfare had a positive effect. Based on these findings, the authors concluded that the second pillar of the CAP is able to improve or at least maintain crop diversity in Slovakia.

In a study about the Natura 2000 site of **Zarandul de Est in Romania**, the authors concluded that direct and rural agro-environmental payments applied to high value nature farming are necessary to provide viable financial support to farmers and achieve the economic impacts described by the CAP ecosystem services approach (Martino and Muenzel 2018). **Under the 2007–2013 rules, CAP payments showed to be equal to 130% of the household income covering the full cost of the average farm in Zarandul de Est.** The authors argued that public support, in the absence of a full implementation of payment for ecosystem services schemes (a market-based instrument), is necessary to limit socio-economic deprivation of European marginalized farms. As alternatives to CAP payments, they proposed income diversification strategies, such as ecotourism and incentives for re-wilding.

Western Europe

Belgium

In a **Belgian literature review study** (Van Vooren et al. 2016), complemented by their own field research, the authors designed an assessment framework to combine crop yield data on tree-crop interactions with farm data (averaged over the country) to evaluate the farm economic outcomes of greening measures promoted by the CAP. Using data from 80 experiments, the authors quantified (i) the effect of trees on crop yield in temperate regions and ii) assessed the economic consequences of two farm-level CAP Ecological Focus Areas (EFA) options —hedgerows and alley cropping. (Under CAP rules, EFA need to be implemented on at least 5% of the arable farm area). The study compared the discounted gross margins of the hedgerow and alley cropping options with the business-as-usual (BAU) option, in which no EFA is applied (and thus no subsidy is received).

A hedgerow is defined as linear structure of unpruned trees and shrubs on the field boundary, while in alley cropping, trees are pruned and the wood is harvested. The results of the EFA options calculated, under the specific circumstances described in the study, indicated that, without greening payments and/or other financial supporting mechanisms, hedgerows and alley cropping —when implemented to meet the 5% EFA requirement on arable farms —are economically unattractive for farmers.

The authors also noted that some use options were not included in their calculations, such as wood chips valorization. Wood chips, when composted and used on the farm to improve soil quality and reduce the need for fertilization, can have a positive effect on yield and revenues in the long term.

France

A study in **France** shed light on the impact of the crop diversity criterion of the green payments on the economic (technical efficiency) and environmental (efficiency) performances of farms. This analysis was based on the 2013 Common Agricultural Policy reform, which introduced green payments to encourage farmers to provide environmental services not compensated by the market. Farmers receiving green payments are required to implement measures such as crop diversification, the maintenance of permanent grassland —including traditional orchards where fruit trees are grown in low density on grassland —and the establishment of ecological focus areas (Diop and Védrine 2025).

Using a difference-in-discontinuity design on a sample of French farms, the results of this study suggested that farms around 10 ha experienced significant land reallocation and an increase in crop diversity, while farms around 30 ha increased their number of crops. Besides, the effects were primarily produced by farms that already met the diversification requirements -hence, the incentives were used by farms that did not need them (authors called this a “deadweight effect”). Overall, the study concluded that the crop diversity

criterion did not result in much additional change and the intended objective was not met. The authors speculated that this policy failure could be attributed to the overly loose criteria set by the CAP.

Sauquet (2022) and Varacca et al. (2023) are two other ex-post studies of the impact of green payments. Sauquet's study found that the crop diversity criterion led to an increase in the number of crops grown and a reduction in the share of the two main crops for French farms above 30 ha. **Varacca et al.'s research found an increase in the share of leguminous crops but no significant effects on other environmental indicators or economic performance (farm income).**

Beyond the crop diversity criterion within green payments, the CAP includes various risk management tools that can also influence biodiversity. One such tool is the **Income Stabilization Tool (IST)**, a risk management instrument (insurance instrument) introduced within the EU's 2014–2020 CAP (under Pillar II) to support farmers facing a severe drop in their incomes, regardless of the cause of this drop. To date, it has hardly been used. Only France, Hungary, Italy, and Spain intended to use it.

IST uptake might discourage farmers from diversifying their cropping systems (a proven risk management strategy), which, in turn, may lead to (bio)diversity loss according to a recent study (Louhichi and Merisier 2024). The study determined the proportion and characteristics of farmers likely to be willing to adopt this tool once implemented by the French government and to assess its effects on economics and crop diversity. The study was conducted using a behavioral optimization model applied to a representative sample of 1375 field crop farms spread across **France**.

The authors concluded that initial IST uptake and utility for farmers in France would be very limited. Second, IST would lead to less income inequality among farmers and benefit smallholders more than large farm holders. Third, IST would stabilize and even boost income but lead to a loss of crop biodiversity. Indeed, IST adoption discourages the use of diversification as a risk management strategy.

Germany

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Italy

A study by Biagini et al. (2020) estimated the income transfer efficiency of a broad set of pivotal policy measures, focusing on how farm structure influences this efficiency. Using dynamic modeling and a micro-data panel of Italian farms for the period 2008-2014, the study accounted for factors such as endogeneity, simultaneity bias, and omitted variables.

The findings revealed that decoupled direct payments made the largest contribution to agricultural incomes, followed by agri-environmental payments and on-farm investment subsidies. In contrast, coupled payments have no significant impact on farmers' income. Generally, for all analyzed CAP measures, large farms benefit from greater transfer efficiency levels compared to medium and small farms. These differences among instruments and across farms suggest that policy-participation costs, along with the economic structure of farms, may play a pivotal role in determining the income transfer efficiency of CAP policies.

Note that since 2014, complementary to the CAP, Italy has adopted National Action Plans for the Sustainable Use of Plant Protection Products to promote integrated agriculture, with further regulations at the regional level. Farming practices are subjected to compulsory and voluntary Guidelines for Integrated Production and production can be certified through the National Quality System of Integrated Production (as well as through private certifications). Studies on the National Action Plans were not reviewed.

An interesting study analyzed the impact of CAP (programming cycles 2007-2013 and 2014-2020) on biodiversity in the largely rural Apulia region of Italy, known for its grape and olive production (Labianca 2022). From 2007 to 2013, the region implemented a rural development program, including an area of work on “Improvement of environment and the countryside”. This program consisted of nine measures aimed at contributing to sustainable development, protecting and enhancing natural resources, and preserving landscapes in rural areas. This initiative targeted communities engaged in the implementation of the Nature 2000 network.

One of the instruments within the program was measure 214, “Agri-environmental payments.” Participating farmers, referred to as “custodian farmers”, received support for conserving crop such as fruits, olives for oil, grapes, grains, and vegetables. This support was contingent on the use of farming techniques that reflected best practices for the local area.

The analysis of applications by custodian farmers across the two programming cycles revealed a progressive spread of the practices, but with concentration in specific areas, particularly in the north and center of the region, where the number of "custodian farmers" was higher. In contrast, other areas in the south of the region had fewer participants. In subsequent years, there was some further geographical distribution of "custodians," but the concentration remained strongest in the north and center, which already had benefited from support.

In terms of crop diversity, the authors observed that the incentives conserved traditional cultivars but did not improve them. Considering the limited impact of the program and specific measure, the authors proposed a new approach —"eco-agriculture"—aimed at reconciling economic viability, ecological relations, and the mutual interdependence between agriculture, biodiversity, and ecosystem services.

Another Italian study by Cortignano and Dono (2019) analyzed the impact of the CAP Pillar I reform and the new greening rules. Across Italy, the study observed that the new measures had a positive environmental impact with only minimal income reductions, but impact differed by region. Incomes increased in the northern mountains, while the use of pesticides grew in the northern plains due to the expansion of intensively cultivated rice and soybean areas. In Southern Italy, agricultural employment decreased, similar to the mountain areas, exacerbating the already high risk of land abandonment.

High Nature Value (HNV) farming, a concept introduced in the 1990s, highlights the positive role of agriculture in promoting biodiversity. It was incorporated into the CAP post-2013, as well as into the European model of multifunctional agriculture, the European Rural Development Policy (2006), and the European Common Monitoring and Evaluation Framework. Studies have analyzed HNV farming in various countries, including Italy, where11% of the territory is designated as HNV farming areas, primarily in upland areas (Trisorio and Borlizzi, 2011).

In their analysis, Trisorio and Borlizzi (2011) hypothesized that given the fragile nature of HNV farming, policy measures should be tailored to particular systems, such as extensive grazing, traditional crop systems, and the maintenance of non-farmed elements in the landscape (buffer strips, hedgerows, ponds, woodland corridors). In Italy, the pressing issue of farm abandonment would require targeted support for generational turn-over, investment aid, and advisory services on biodiversity and nature conservation practices.

Portugal

A review study by Pereira et al. (2017) analyzed the interrelationships between the **Portuguese agricultural** sector and the CAP over the past three decades. The authors concluded that, while there have been improvements in the impacts of Portuguese agriculture on the environment, spatial asymmetries remain. Changes in production patterns include a reduction in arable cropping and an increase in pastures and livestock. Landscape use shifted, with an increase in construction and forestry and a reduction in soil use for agriculture and agroforestry. Competitiveness decreased (mainly after the 1992 CAP reform). No farm-level data were provided in the study.

The Netherlands

A study conducted in the Netherlands by Kleijn et al. (2001) evaluated the contribution of agri-environment schemes to the protection of biodiversity in intensively used Dutch agricultural landscapes, focusing on plants, birds, hover flies, and bees. The study examined 78 paired fields that either had agri-environment schemes in the form of management agreements or were managed conventionally. The study showed that management agreements were not effective in protecting the species richness of the investigated species groups; no positive effects on plant and bird species diversity were found. The four most common wader species were observed even less frequently in fields with management agreements. Hover flies and bees

showed modest increases in species richness on fields with management agreements. The results indicated that there is a pressing need for a scientifically sound evaluation of agri-environment schemes.

van Dijk et al. (2014) noted that in the Netherlands, the first farmer cooperatives coordinating agri-environmental measures, known as Environmental Cooperatives, were established in 1991. From 2000 onwards, the Dutch government-funded agri-environmental program created opportunities for Environmental Cooperatives to apply for two regional Agri-Environmental Schemes (AES): nature-friendly management of ditch banks and the protection of meadow birds. These AES often covered more than 100 hectares and involved many farmers. The authors emphasized that this cooperative model was considered a success in the Netherlands and subsequently adopted by other countries in Europe and beyond. However, the study does not mention any farmer income gains associated with the scheme.

Runhaar (2017) analyzed nature-positive oriented agricultural policy measures in the Netherlands, including CAP measures (e.g., Agri-Environmental Schemes, AES), bottom-up "measures" taken by, for example, environmental cooperatives (see van Dijk et al. 2014), and company-initiated schemes in which farmers are rewarded for good performance and penalized for bad ('bonus-malus' system). The study found that only a small proportion of all Dutch farmers participated in each of the 10 measures assessed. Ecologically, the performance of the 10 measures was considered poor. CAP AES measures implemented until January 1, 2016, allowed farmers to participate on a voluntary basis and implement self-selected conservation measures; these were usually easy to implement but had modest ecological impacts.

A Dutch study by Buitenhuis et al. (2020) analyzed the degree to which the CAP 2014-2020 enabled or constrained the resilience of an intensive arable (potato-based) farming system in the north of the Netherlands (the region known as De Veenkoloniën). The study showed that CAP supports the robustness of the farming system fostering business-as-usual including the continuation of monocropping (through hectare-based direct payments). This focus did not build or strengthen the adaptive capacity of the farming system, e.g., through crop diversification, let alone the transformative capacity needed to face the problem of loss of soil fertility, the impact of climate change, and other stresses (e.g., price collapse of potato starch).

United Kingdom

A study of 2,333 farms in England and Wales, conducted from 2007 to 2015, used separate multilevel models for a range of different farm types to provide targeted recommendations for farmers (Harkness et al. 2021). The results showed that greater agricultural diversity (i.e. a lower degree of specialization in different crop and livestock activities) increases the stability of farm income across dairy, general cropping, cereal, and mixed farms. In the modeling, increasing the degree of specialization by one standard deviation (using standardized coefficients) led to an increase in income variability by approximately 20%. The study also found that dairy, general cropping, and mixed farms that receive more agri-environment payments have more stable incomes. In contrast, an increase in direct subsidies paid to farmers based on the area farmed is associated with a relatively large decrease in the stability of farm income, ranging from 6 to 35% across most farm types. Reducing input intensity was identified as an important factor for increasing income stability for all farm types, with a 20% reduction in income variability on average. The authors concluded that engagement in environmentally sustainable farming practices, such as AES, can enhance agricultural diversity, and reducing input intensity may help increase the stability of many farm businesses whilst at the same time reducing the negative impacts of farming on the environment.

Other initiatives

NATURA 2000

The Natura 2000 network, the EU's most important network of protected areas, was established through the European Habitats Directive 92/43/EEC and the Birds Directive 79/409/EEC. It includes 25,717 terrestrial sites, covering 17.9% of the EU-27 land territory. However, assessments of conservation efforts in these designated habitats are largely negative due to the ongoing encroachment from agriculture, forestry, and other interventions.

A review of studies conducted on the Natura 2000 network in Europe between 1996 and 2014 (572 references) found that 79% of the studies were ecology focused, while 21% were socio-political, with no meaningful interdisciplinary research. The authors concluded that, despite the importance of social sciences in conservation biology, there are serious conceptual, methodological, and epistemic gaps between the disciplines addressing ecology and society. These gaps, the authors remarked, are aggravated by poor interdisciplinary communication and negatively influence conservation design and practice, often leading to conservation efforts that are disconnected from the social and political realities (Popescu et al. 2014).

Not all assessments of the impact of Natura 2000 measures are negative. Schirpke et al. 2018 analyzed the socio-economic impact of Payment for Ecosystem Services (PES) schemes, which are not funded by the CAP, across 50 cases in 21 Natura 2000 sites in Italy. Overall, the results showed positive effects on the socio-economic development of the local communities and an improvement in the defined conservation objectives. Notably, PES schemes focused on regulation (water) and cultural services (recreation) scored well on ecological and socio-economic indicators. The authors concluded that PES schemes in protected areas can contribute to overcoming biodiversity finance gaps and strengthen sustainable development.

HORIZON Projects

In the **DIVERSIFOOD** project, funded by the EU Horizon 2020 Research and Innovation program and implemented by partners in 12 countries (Chable et al. 2020), **parallel experiments with underutilized genetic resources** were carried out, aiming to promote their reintroduction for the provision of agroecosystem services and the development of local value chains for high-quality products.

Evaluation studies conducted by the DIVERSIFOOD project included (i) crop descriptors, i.e., those phenotypic traits useful to identify a genetic resource; (ii) agroecosystem performance as a driver of environmental fitness; (iii) productive performance as a driver of yield potential; (iv) quality performance as a driver of success in local, high-quality value chain. The results showed that the yield of underutilized crops is generally low, or difficult to harvest, but in many cases such crops can be a solution for marginal conditions. Quality performance results showed that many of the derived products need adaptation in processing (through artisanal methods).

Second, the project also carried out plant breeding activities to valorize and to increase cultivated diversity: (i) developing new populations, (ii) multi-actor participatory plant breeding and use of innovative designs, and (iii) improving methods and tools to carry out on-farm experimentations for population breeding and evaluation.

Third, the project mapped and analyzed **community seed banks**, revealing that in southern and western European countries, they were primarily initiated and managed by farmers, while in northern and central European countries, private gardeners took a leading role. Many initiatives shifted their approach from a mainly conservation to a more evolutionary one, as the goals of crop adaptation and participatory plant

breeding acquired importance. On average, these seed banks managed several hundred accessions, mainly local and farmers' varieties as well as old commercial varieties, but also their own breeding populations.

Fourth, market relationships were mapped, spanning from territorially embedded niche markets in the forms of short chains to collaborations with conventional large retailers, with the goal of upscaling the market for biodiverse products. Central to the marketing efforts was the capacity to preserve the values embodied in the biodiverse products and to communicate them to consumers, fostering their appreciation.

LIVESEED, another Horizon 2020 project (2017-2021) used interdisciplinary and multi-actor approaches to transform the organic seed and plant breeding sector 100% availability of organic seed of cultivars for organic agriculture (LIVESEED 2021). The project worked on legumes, vegetables, fruit trees, cereals, and fodder crops, considering diverse cropping systems across Europe, including mixed cropping and agro-forestry.

In LIVESEED, breeding designs were optimized to breed genetically diverse cultivars that integrate several kinds of traits, from ecosystem adaptation, phenology, phenotype of the plant, to production and product qualities. Research was done on the legal, technical, scientific, and socio-economic aspects that impact the use of organic seed from breeding to seed availability.

One of the key findings was the lack of business opportunities for organic seed companies and insufficient availability of organic cultivars in Europe, hindering the production and use of organic seed. The project developed adapted regulations for DUS (distinctiveness, uniformity, stability) and VCU (value for cultivation and use) testing criteria to facilitate a more effective official release of organically bred varieties. These new regulations found fertile ground in the new EU organic regulation (848/2018) and the new regulatory scope for "organic heterogeneous material" and "organic bred varieties suited for organic agriculture." These developments are expected to foster more diversified breeding strategies and seed systems, but the project did not carry out farm assessments.

NON-CAP SUPPORTED PROJECTS

A study in the Netherlands by Juventia and Van Apeldoorn (2024) analyzed the benefits of strip cropping, a form of intercropping that facilitates crop diversification, for productivity and ecosystem services. In this practice, strips of 6 meters in width were cultivated. No subsidies were received for this novel practice.

The authors used three-year data (2020–2022) from a 64-ha organic strip cropping system (of the largest commercial organic farm located in Flevoland) in the Netherlands to (1) evaluate the effects of crop neighbors and strip cropping on yield and (2) explore if optimizing the allocation of crop neighbors in alternative strip cropping configurations can improve yield and revenue performances. The authors analyzed the edge effect and strip cropping effect on yield of six crops grown in strips, each neighboring a total of five crops. The yield data was then used to evaluate the performance of the current and alternative strip configurations in terms of Land Equivalent Ratio and relative revenue.

The results showed that except for the positive effect observed on potato (grown along celeriac or broccoli), edge effects lacked statistical significance. **The strip cropping effect was different for each crop: positive for faba bean and parsnip, neutral for celeriac and potato, and negative for oat and onion. Analysis across crops showed an overall significant positive strip cropping effect on yield.** The positive but variable strip cropping effects observed in the current experimental design and the two alternative configurations suggest that prioritizing increased crop diversity over optimized spatial arrangements may offer better results.

While the study demonstrated increased productivity through strip cropping, further research is needed to expand the database on optimal crop combinations, extending the evaluation beyond yield and revenue performances to facilitate broader adoption of strip cropping in the Netherlands and Western Europe.

Another crop diversification study in the Netherlands (Juventia et al. 2021) explored the effects of different spatial arrangements and levels of genetic crop diversity on two commercial and two experimental organic farms in 2018, with no subsidies involved.

The authors analyzed the effect of seven intercropping designs on cabbage quality, yield, and crop injury. Provisioning services were measured through individual cabbage fresh weight and yield per unit area. The findings revealed a significant negative relationship between crop diversity and herbivore feeding injury per cabbage. Specifically, intercropping designs with more species, accessions, and/or cultivars exhibited lower feeding injury.

Additionally, the presence of flower strips significantly reduced overall injury in the adjacent cabbage strip, although higher injury was found in the rows closer to the flower strip. Five out of seven intercropping designs maintained total yield per area when compared with the sole crop.

The authors concluded that crop diversification can support the production of ecosystem services by maintaining fresh marketable weight per cabbage plant, enhancing productivity per unit area, and providing the regulating ecosystem service of pest control.

FINAL REFLECTIONS

Based on a comprehensive, though not exhaustive, literature search on the internet, around 45 publications focused on agro-ecological policy measures, including supporting (agro)biodiversity protection (conservation), were reviewed and summarized in this report. The primary focus was on initiatives (projects) implemented under the umbrella of the Common Agricultural Policy of the European Union, by far the largest financial source supporting agricultural development on the continent. The initiatives reviewed cover both Eastern and Western Europe. Under the CAP, subsidies are available for farming support based on land area cultivated, for young farmers and new farm enterprises, and for the implementation of specific agro-ecological measures, including, for example, organic farming. Maximum subsidy amounts per type of support are fixed by the EU member states. While comprehensive data is not easily accessible, some indicative data are included in the report.

31 studies analyzed the impact of one or more (CAP and other) policy measures on one or more outcomes. The policy measures and the number of studies reporting them are: coupled payments (1), direct payments (5); biodiversity conservation (2), creation of producer organizations (1), High Nature Value farming (1), income stabilization tool (1), increasing forest cover (1), mixed crop and tree management (5), on-farm investments (1), organic farming, processing and marketing (4), eco- and landscape schemes (15), mulching (1), Payments for Ecological Services (1), protection of flora and fauna (3), R&D/advice/training/information (1), rural development programs (3), short supply chains and local markets (1), and subsidies for animal welfare (2).

The main outcomes and the number of studies reporting them are: (agro)biodiversity conservation (11); climate and environmental protection (6); farm income (14); resilience (1); and sustainable farming based on diversification (11).

The review shows that there are **very limited long-term data (sets) about the systematic evaluation of the socio-economic impacts (farm income, income distribution among farmers) of the CAP (and other) agrobiodiversity policy measures**. From the review, it is also evident that there is a lack of comparability across available assessment studies, making it difficult to generalize the findings. While several studies based on modeling were found, there were fewer that relied on empirical data. Overall, the studies

reviewed largely agreed that successive phases of the CAP have struggled to effectively achieve the interlinked goals of conserving (improving) biodiversity and supporting (improving) farm income. This challenge is partly due to trade-offs between the two goals. These trade-offs have been poorly understood and have not been incorporated in policy design.

Agri-environment schemes (AES) and landscape measures have had mixed results on biodiversity conservation (and income). Organic farming, supported by CAP measures, contributes more to biodiversity conservation than conventional agriculture, but benefits are usually small and come at the cost of yield deficits. The impact on farm income has been poorly analyzed. Tscharntke et al. (2021) argued that, even with the EU Green Deal's goal of achieving 25% organic farming by 2030, addressing the remaining 75% of conventional agriculture in most European landscapes remains a significant challenge.

It is not clear if the latest EU incentives and regulations for biodiversity-friendly measures (CAP post 2023) will contribute to a transition to much higher levels of cropland diversification. To achieve this, farm-level management measures need to be complemented with landscape level measures, combining diversified agriculture and semi-natural habitat conservation.

The review highlights the need for more detailed and tailor-made measures, as well as better monitoring and evaluation of outcomes and impact. In this regard, the most recent policy shift toward focusing on the outcomes of payments to farmers can be seen as positive. It directs the design and implementation of policy measures towards adaptive management, emphasizing the capacity of land managers for innovation, co-creation of knowledge and practices, and a learning-driven agenda (Herzon et al. 2017).

At the same time, it is important to realize that farmers make their own decisions, based on different knowledge and skills, which will result in different profiles of diversification. A study from France showed that this can mean that some farmers practice simple compliance with European CAP regulations (using one practice, such as a cover crop) while others implement a redesigned, more complex system, e.g. agroforestry. The same study found that effective implementation is often hindered by factors such as lack of labor and/or specialized machinery, poor access to market opportunities, and limited exchange of knowledge through networking (Casagrande et al. 2017). This leads to the **conclusion that novel instruments might be needed that are based on a much better understanding of the factors that influence farmer's decision making.** These factors include economics but not solely; social and political factors also play a role, e.g., measures could be co-developed by farmers and other stakeholders, including governments, as suggested by some authors (Schwerdtner Máñez, Born, and Stoll-Kleemann 2023), or through the collaboration among farmers at landscape level (Leventon et al. 2017).

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