In collaboration with FACCEJPI

The Large Blue © David Simcox

POLICY BRIEF

The Common Agricultural Policy can strengthen biodiversity and ecosystem services by diversifying agricultural landscapes

Main findings

If managed appropriately, Europe's diverse farmland landscapes can provide many benefits to people and nature as well as more sustainable agriculture. Ecosystem services such as **pollination and natural biological pest control** depend strongly on the amount of semi-natural habitat patches on farmland, and the preservation of such habitats will become even more important due to the effects of climate change.

Conservation of **heterogeneous landscapes**, characterized by a high proportion of semi-natural habitats such as pastures and field margins, enhances and stabilizes **pest control by natural predators and pollination by wild insects** and decreases sensitivity to climate change. Increasing **habitat diversity enhances biological pest control** independently of crop diversity, indicating that it is an effective strategy for farmers.

Key policy recommendations

- Improve the use of EU Common Agricultural Policy (CAP) measures to maintain and restore semi-natural habitats and landscape elements (such as pastures, meadows, trees, hedgerows, forest patches, ponds and field margins) in agricultural landscapes for their value for biodiversity, pollination and natural biological control of pests.
- Set policy targets for the minimum proportion of uncropped areas in arable farmland areas to maintain and increase the stability and resilience of biodiversity and ecosystem services in the face of climate change.
- Set CAP policy targets for the conservation and restoration of semi-natural farming habitats including the Natura 2000 network.
- Recognise the long term environmental, social and economic values of mixed farming landscapes and improve the coherence of CAP measures and implementation to help maintain such systems and landscapes against the pressures of specialisation.

Context

Europe's diverse landscapes of agricultural and forest land, and semi-natural habitats are shaped to varying degrees by traditional and modern systems of land management. These landscapes contain important parts of Europe's green infrastructure and their ecosystems provide a range of services with numerous economic, social and other welfare benefits, depending on how they are managed. Biodiversity is a central component of ecosystems and their services, and more biodiverse ecosystems are more resilient to climate change. Despite these recognised benefits, the mid-term review of the EU Biodiversity Strategy showed that biodiversity in agricultural areas has continued to decline and that greater efforts are needed to ensure its conservation and restoration. The 7th Environment Action Programme calls for policies to promote the establishment and maintenance of ecologically valuable farmland.

The EU strategy on Green Infrastructure calls for funding opportunities for habitat restoration and creation to be integrated into the EU Common Agricultural Policy (CAP) and other EU funding mechanisms. The CAP has a key role to play because one of its objectives is to support the sustainable management of natural resources including biodiversity, and to provide environmental public goods and ecosystem services. The CAP's environmental objectives are mainly achieved through targeted Rural Development Programme (RDP) funding, in particular agri-environment-climate schemes. In addition, Pillar 1 greening measures provide a basic layer of environmental and climate measures applicable to the majority of the farmed area as well as wider-scale cross-compliance conditions on CAP direct payments.

This brief considers how the results of four BiodivERsA- and one BiodivERsA/FACCE JPI- funded projects can inform the debates on the future orientation of the CAP post 2020 so that it can restore and conserve biodiversity more effectively and deliver required ecosystem services, through better management of landscapes, as well as making ecosystem services and biodiversity more resilient to climate change. It specifically builds on results from the research projects APPEAL, CONNECT, ECODEAL, EC21C, and FARMLAND. Results from European Commission-funded research was also considered (GREENVEINS, STEP, BEEFUN).

Key results

The IPBES assessment and research has shown that wild bees increase pollination of crops significantly irrespective of honeybee density (Garibaldi et al 2013) and that hoverflies are also important pollinators (Rader et al 2016). Also, higher pollinator density and pollination events can translate in higher fruit/grain yield (Steffan-Dewenter et al. 1999).

How much semi-natural habitat is needed by wild bees in agricultural landscapes?

Wild bee diversity is strongly determined by **the amount of semi-natural habitats in agricultural landscapes** (including permanent grass-lands, woodland patches and hedges), and their level of fragmentation. Carrié et al (2017) found that the exact relationship depends on bee body size and nest location. Small-bodied, solitary bee species are more closely bound to semi-natural habitats because they are less able to disperse and forage widely and need to nest close to foraging resources. Schulp et al (2014) mapped crop land requiring pollination and wild bee habitat across the EU. They showed that on 12% of Europe's arable land, green linear elements are the only habitats supporting crop pollinators and their presence increased flower visitation probability by 5-20%.

There is a scientific debate over whether wild bees are helped more by adding nesting habitat or foraging habitat, such as temporary flower margins. The pollinator model developed by Häussler et al (2017) predicts flower visitation rates by wild nesting bees in landscapes. Pollination of crops can be enhanced by making sure there are enough semi-natural habitat patches in arable farmland. Field margin habitats in intensively managed arable cropland are particularly valuable, and they should include both permanent margins suitable for nesting bees, and temporary margins rich in flowers for foraging bees, especially later in the season when there are no flowering crops. The model showed that the effects of flowering habitats on bee populations build up over time.

Diverse landscapes and semi-natural habitats enhance pest control for crops

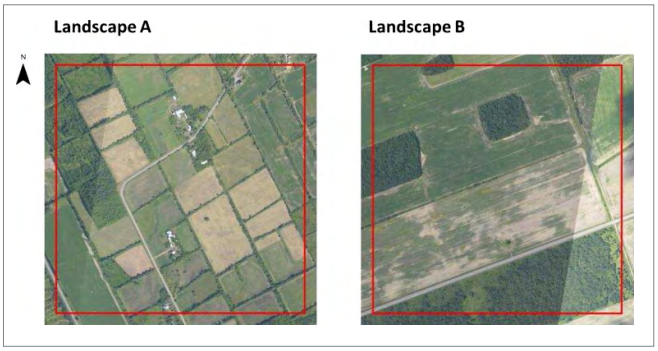
There is strong evidence that better conservation of **heterogeneous landscapes**, characterized by a high proportion of semi-natural habitats such as pastures and field margins, **enhances and stabilizes the biological control provided by natural predators** in agro-ecosystems.

Bertrand et al (2016a, 2016b) found that large fields with a low density of field margin habitats may still have high predatory carabid beetle abundance but functional diversity declines compared to small fields with a denser network of field margin habitats.

It is not so clear whether increasing the diversity of crops either spatially or temporally through crop rotations benefits biodiversity and ecosystem services directly.

For the first time, Rusch et al (2013) disentangled the relative effects of landscape complexity and crop rotation intensity on natural pest control. Pest control increases with landscape complexity, independently of the length and diversity of crop rotations. Therefore, **increasing semi-natural habitat can improve natural pest control even in landscapes dominated by simple intensive arable rotations**.

Smaller fields with more field margin habitats have more biodiversity



Landscapes A and B have the same total area of natural and semi-natural habitat, but A has small crop fields and more edges while B has large fields and more forest patches.

Landscapes with smaller fields and more field edges have more biodiversity in crop fields than landscapes with large fields, even when the total area of semi-natural habitat is the same. These are the findings of the Fahrig et al (2015) comparison of mixed agricultural landscapes in Canada, where field sizes are similar to intensive arable regions in Europe, such as East Anglia in the UK (i.e. average around 4.5 ha). This indicates that putting strips or patches of grass and flowers into these fields could increase biodiversity and associated ecosystem services. The CAP greening measures require these intensive arable regions to create Ecological Focus Areas.

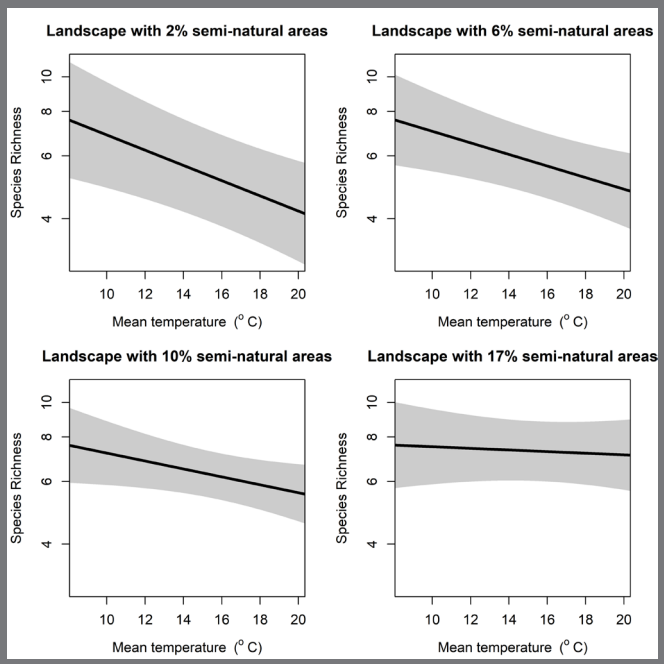
Having enough semi-natural habitat can buffer negative effects of climate change

Semi-natural areas and green infrastructure elements within agricultural landscapes become even more important under changing temperature conditions as they can mitigate the negative effects of increasing temperatures on wild bee species richness and total abundance.

Research has found a strong negative relationship between wild bee species richness and temperature. Papanikolaou et al (2016) found that **having a high proportion (around 17%) of semi-natural habitats in agricultural landscapes can considerably decrease the detrimental effect of short term temperature rises on bee species richness and abundance**.

This concurs with other EU funded research findings (Billeter et al 2008) that a sufficiently large proportion of semi-natural habitats and landscape features in farmland, between 10 and 20%, could largely buffer the negative effects of agriculture intensification on biodiversity and decrease its sensitivity to climate change.

Interactive effect of temperature and landscape composition on wild bee species richness



Policy recommendations

Use the scientific evidence and the EU 7th Environment Action Programme to **improve the use of CAP measures to maintain and restore semi-natural habitats and features/elements (e.g. hedges, forest patches, ponds, pastures, meadows and field margins) in the agricultural landscape.**

BiodivERsA, BiodivERsA/FACCE JPI, and EC-funded projects have reinforced the knowledge base on the critical importance of semi-natural habitats for biodiversity and key ecosystem services on farmland, i.e. pollination and pest control.

The 2020 reform of the CAP is an opportunity to set a high priority to maintaining and where necessary restoring such habitats, through the following potential actions:

- **Set policy targets for the minimum proportion of uncropped areas** (e.g. wildlife seed mixes, semi-natural habitats, and landscape features) in arable farmland areas needed to maintain the stability and resilience of biodiversity and ecosystem services under climate change.
- **Set CAP policy targets for the conservation and restoration of semi-natural farming habitats**, especially the habitats in the Natura 2000 network. Rural Development Programmes should be used as a key source of funding for the network.
- **Increase the funding of agri-environment climate measures and their targeting to maintain semi-natural habitats** that are most at risk, or in need of restoration (thereby also contributing to the EU Biodiversity Strategy Target of restoring 15% of degraded ecosystems).
- **Modify the rules and weightings for Ecological Focus Areas (EFAs) to encourage the selection of semi-natural vegetation options by farmers, and promote measures to make farmers aware of the benefits** (e.g. from enhanced pollination of crops and natural predator control of pests). EFAs could offer more wild bee and pest predator habitats on farmland if they provide enough undisturbed nesting habitat and floral resources close to fields. The current EFA option for field margins is not being used by many farmers for various reasons which are partly to do with the rules, and partly because there is a low level of awareness of the benefits both to biodiversity and to farming.
- **Use the CAP to maintain mixed farming landscapes against the pressure of specialisation.** The CAP can help maintain and promote mixed and diverse farming systems with animals and crops that have diverse landscapes rich in green infrastructure. Most European regions with mixed farming have small average field sizes (1-2 ha or smaller) with a dense network of field edge habitats. Improved coherence of CAP measures and CAP implementation could help maintain such systems and landscapes against the pressures of specialisation.

Links to sources

FARMLAND project website
APPEAL project website
CONNECT project website
EC21C project website
ECODEAL project website

Scientific publications used in this policy brief can be found in the Information Sheet of this briefing, downloadable from www.biodiversa.org/policybriefs.

About this Policy Brief

This Policy Brief is part of a series aiming to inform policymakers on the key results of four BiodivERsA- and one BiodivERsA/FACCE JPI-funded projects, and provide recommendations to policymakers based on research results. Three EC-funded projects were also considered (GREENVEINS, STEP, BEEFUN).

The series of BiodivERsA Policy Briefs can be found at www.biodiversa.org/policybriefs.

This publication was commissioned and supervised by BiodivERsA, and produced by the Institute for European Environmental Policy (IEEP).

The key research results presented here were validated by researchers from the APPEAL, CONNECT, ECODEAL, EC21C, and FARMLAND research projects.

The policy recommendations made do not necessarily reflect the views of all BiodivERsA partners.

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