



BESTMAP

BEHAVIOURAL, ECOLOGICAL AND
SOCIO-ECONOMIC TOOLS FOR
MODELLING AGRICULTURAL POLICY

Agri-environmental practices in agricultural landscapes: insights and recommendations from the European project BESTMAP

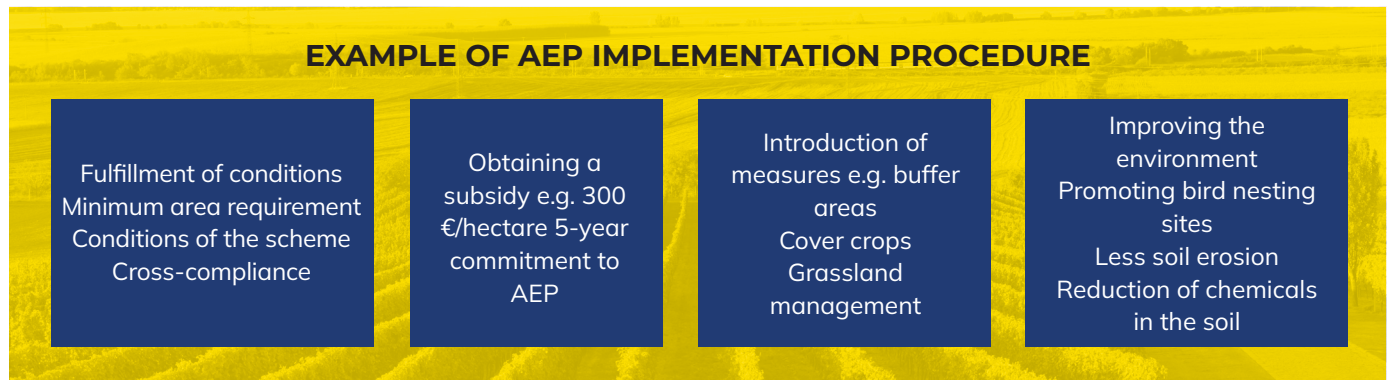
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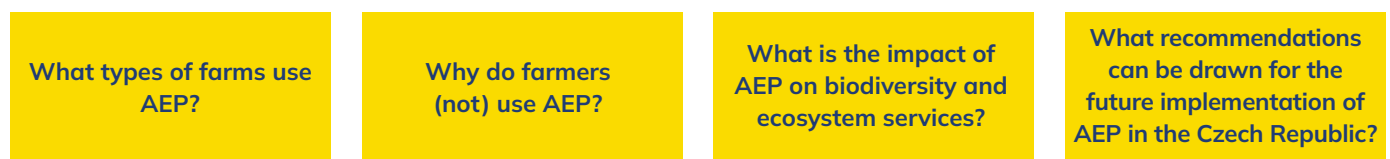
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement no. 817501



Population growth and consumerist lifestyles are leading to increasing demands for stable food production. However, traditionally, the more intensive use of agricultural land was not considering environmental aspects, thus having a negative impact on the environment. For this reason, agri-environmental practices (AEP for short) are used in agriculture to increase the sustainability and multifunctionality of the agricultural landscape. Instruments that are part of the EU's Common Agricultural Policy include, in particular, agri-environmental-climatic measures (AECM), payments for greening, e.g. ecological focus areas (EFAs), or organic farming.



The aim of the BESTMAP project was to develop a methodological framework for modelling the impact of agricultural policies (mainly AEP) on the agricultural landscape. The project's methods take into account the complexity of farmers' decision-making and the different preferences of different types of farms. At the same time, the project assesses the impact of different AEP implementation scenarios on biodiversity and ecosystem services in the case study area of the South Moravian and Zlín regions. Specifically, we sought to answer four key questions:



What types of farms use agri-environmental practices?

From the Land Parcel Identification System (LPIS) database, a classification of farms, the so-called farming system archetypes, was created on the basis of economic size and farm specialisation according to the simplified Farm Accountancy Data Network (FADN) methodology. The spatial analysis of the farm archetypes and the data of the Ministry of Agriculture on AEP uptake revealed that:

- In terms of the total number of farms, 28% are focused on general cropping (P1), 32% on permanent crops (P3), 23% on livestock and forage production (P4), 16% on mixed crop and livestock production (mix), and <1% on horticulture (P2). P1 farms are typically large in terms of economic size; P3 and mixed farms are more evenly distributed across all economic size classes; P4 farms are mostly small farms.
- The vast majority of farmland (78%) is farmed by economically large farms focused on general cropping (P1).
- Large farms are more likely to use AEP and implement a broader portfolio of measures, while small farms use AEP less frequently and focus on a few types of measures.
- Higher uptake of agri-environmental programmes is found on livestock farms (77%) and permanent crops (61%). The lowest proportion of AEPs is found on arable farms (19%).

- Some types of AEP (e.g. buffer areas, cover crops and fallow) are primarily used by large farms focused on arable or mixed production, while grassland management and organic farming are more common on medium and small farms focused on livestock and permanent crops (Fig. 1).
- Organic production is found in all farm archetypes (Fig. 1), but farms operating under organic farming are less likely to use other agri-environmental instruments (AECM, EFA) compared to conventional farms.
- Farms not using any of the AEPs are in most cases of small economic size (Fig. 1).

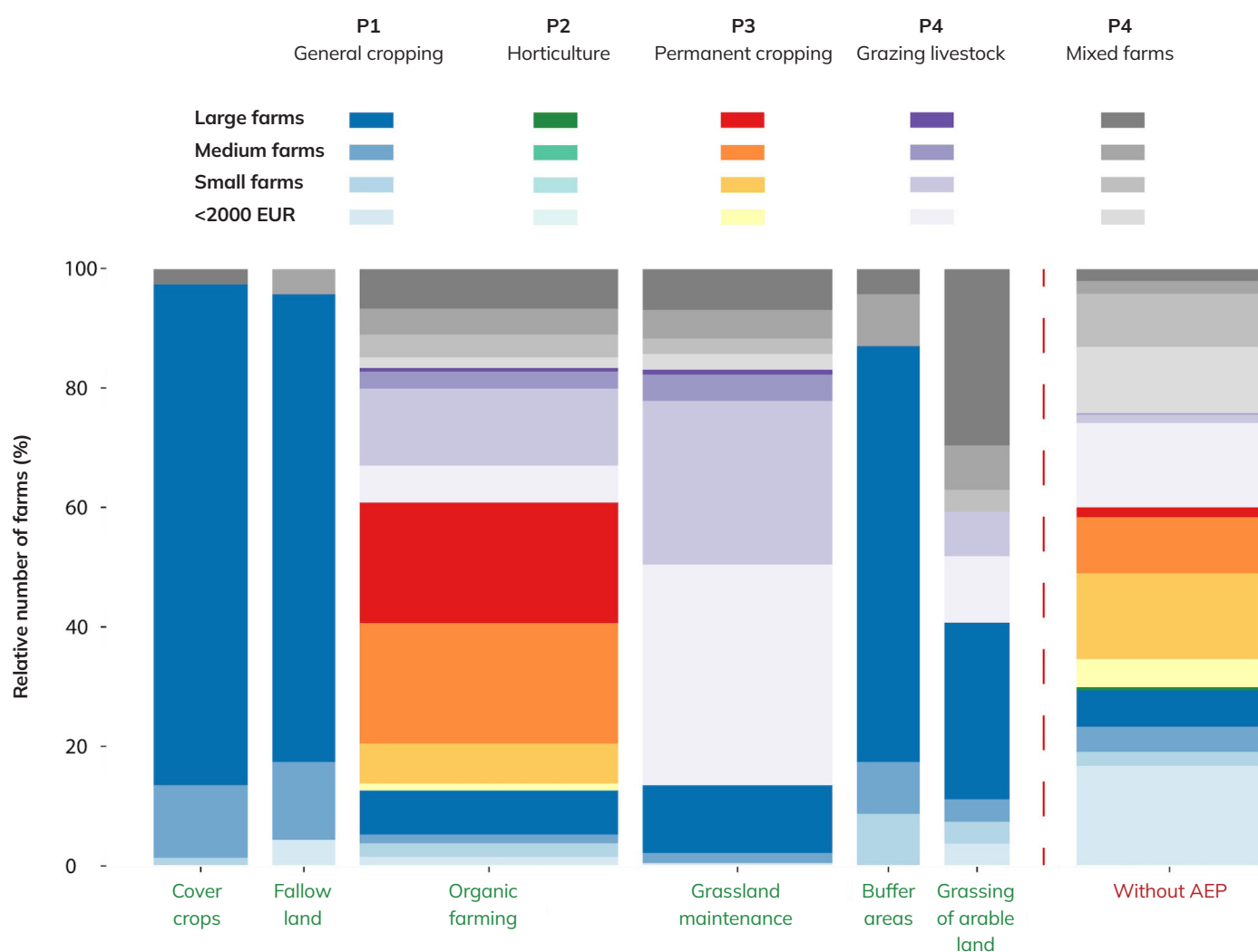


Figure 1: Use of selected agri-environmental approaches (AEPs) across different farm types.



Why do farmers (not) use agri-environmental practices?

Based on structured interviews and questionnaire surveys of farmers conducted between 2020 and 2022, supplemented by the results of agent-based models, we found that:

- The main motivation for farmers to adopt AEP is economic compensation for lost profits and income diversification. The environmental impact of farming is a secondary reason.
- The economic benefits of AEP are more significant for conventional farms than for organic farmers.
- Farmers tend to apply only those AEPs that are consistent with their established farming practices.
- Awareness about the AEP implementation is good, but farmers criticise the high bureaucratic burden which, due to the lack of administrative capacity, constraints especially smaller farms.
- Farmers' motivation is largely related to the duration of the support. For permanent grassland measures, farmers would prefer longer contracts, whereas for arable measures they prefer shorter or more flexible contracts. Long-term measures are preferred provided that farmers have long-term tenancy agreements (80% of farmers farm on rented farmland, while only 20% are owners).
- According to farmers, the main obstacles to higher AEP uptake are:
 - Insufficient financial compensation for the income foregone
 - Strict conditions for individual measures (e.g. minimum area, fixed dates for mowing or grazing)
 - Excessive bureaucratic burden

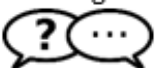
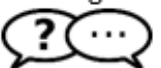
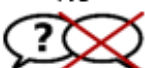
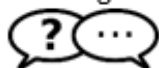
	Flower areas/strips	Cover crops	Maintaining permanent grassland	Converting arable land to permanent grassland	No scheme
Duration of contract	1 year 	10 years 	5 years 	10 years 	You will not receive funding for any agri-environmental practices you may carry out on your farm.
In-person advisory support	Yes, free of charge 	Yes, free of charge 	No 	Yes, free of charge 	
Administrative effort	Low 	High 	Medium 	Medium 	
Yearly payment	£825 per hectare	£90 per hectare	£140 per hectare	£1,100 per hectare	

Figure 2: Sample of a portion of the survey (September 2021-April 2022) where farmers selected from several hypothetical AEP settings based on their preferences.

What is the impact of AEP on biodiversity and ecosystem services?

Based on data on landscape structure, climate and soil parameters, crops grown, and farm characteristics and management, bio-physical models were developed for biodiversity (e.g. farmland birds) and three selected ecosystem services: (1) standard agricultural production, (2) nutrient levels in surface water, and (3) soil organic carbon. Using these models, the environmental impact of AEP was assessed and scenarios of different agri-environmental implementation were compared. The results show that:

- AEPs increase the habitat quality of indicator taxonomic groups (e.g. farmland birds) in agricultural landscapes (Fig. 3). The degree of positive effect depends on the type of AEP, the species and the spatial scale.
- Habitat connectivity with natural features at a broader landscape scale is more important than specific measures at the occurrence site of a given species. This is particularly true for measures on arable land; on permanent grassland the local effect of individual measures is also important.
- The effect of AEP on biodiversity is positive but weak. The current level of implementation of AEP, covering on average less than 5% of agricultural land, is too low to have a significant impact on biodiversity.
- The use of AEP leads to a slight reduction in standard production for most measures and farm types, especially livestock and mixed farms.
- However, the introduction of AEP has a positive effect on surface water quality as it leads to a reduction in the export of nitrogen (N) and phosphorus (P) to water sources, again particularly in livestock and mixed farms.
- AEPs also increase soil organic carbon on average across all farm archetypes, depending on the specific measure, crops grown and intensity of management.

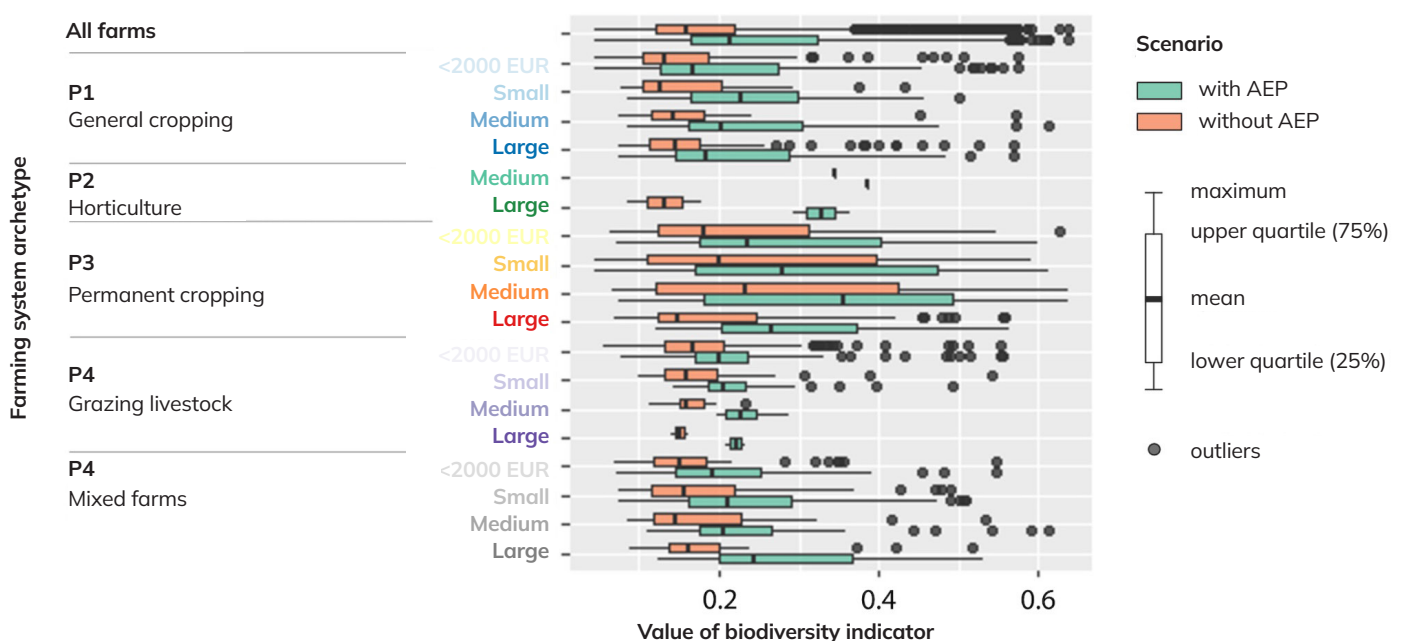


Figure 3: Impact of AEP on habitat quality of farmland birds - comparison of current AEP status with a scenario simulating the absence of AEP on agricultural land at the level of individual farm archetypes.

What recommendations can be drawn for the future implementation of AEP in the Czech Republic?

Based on information from farmers, analyses of environmental and socio-economic data, and models developed taking into account the complexity of decision-making of different types of agricultural actors, we can conclude the following.

To increase the use of AEP by farmers, it is desirable to:

- Increase the level of financial support so that it sufficiently compensates farmers for the income foregone.
- Reduce the level of bureaucratic burden, which is a major obstacle for the uptake of AEP, especially for farms of small economic size.
- Increase administrative support and access to free and high-quality advice that can help to reduce the bureaucratic burden and to integrate AEP into farm management plans.
- Increase flexibility of individual AEP conditions in terms of length of contracts, minimum area requirements, cutting and grazing dates, etc. Allocate more funding to Pillar II and the newly created, more flexible 'eco-schemes' which partly take over the function of greening and AEEM.
- Clearly communicate the objectives and environmental benefits of AEP to help increase farmers' willingness to participate in schemes whose benefits are often unclear or unconvincing to farmers.



To increase the benefits of AEP for biodiversity and ecosystem services it is desirable to:

- Increase the total area of established AEPs to form a more interconnected system of nature-friendly management of farmland.
- Aim to increase the area of established AEPs on large farms and increase participation in agri-environmental programmes on small farms.
- Offer a broad portfolio of diverse measures that would provide a diversified mix of shelter habitat and food resources for different taxonomic groups.
- Clearly define the expected benefits of AEP for biodiversity, e.g. define minimum conservation targets that must be met for a particular site, habitat type or specific species. Ensure better spatial or species targeting through results-based measures.
- Clearly define the expected benefits of AEP for the provision of ecosystem services, e.g. minimising nutrient leaching in sensitive areas or maintaining adequate soil properties to ensure long-term productivity. Determine which types of AEP are appropriate for specific objectives.
- Consider the possibility of cooperative schemes involving the joint engagement of neighbouring farms, e.g. to increase habitat connectivity or to achieve a minimum required AEP area, which may support the effectiveness of AEPs at a broader landscape scale.

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DURATION

September 2019 – February 2024

ACKNOWLEDGMENTS

The policy brief is the result of collaboration among partners of the European project BESTMAP. We extend our gratitude to the RISE Foundation and The University of Leeds for their support in facilitating the discussions and validating the contents.

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