

## Bringing Life back to the Fields: The Power of Hedgerows

SDG215 Life on land

Group 5: Astrid Berghald, Ask Nybø Kaldestad, Charlotte Robert, Egil Andersen and Iara Malhão

### Introduction

In light of the growing global decline in biodiversity, we explore the implementation of hedgerows as a strategy to combat biodiversity loss, particularly in regions experiencing large-scale land expansion for food production. Land use, meaning the modification or management of land by humans, is, according to the IPBES, the biggest driver for biodiversity loss (IPBES, 2019; Tresise *et al.*, 2021). Land use in the form of agriculture tends to transform complex ecosystems into homogenised and intensively managed landscapes, and with the increase of such activity that we see today, there is a reduction of natural habitats, limiting species' ability to feed, avoid predators and reproduce (Tscharntke *et al.*, 2005; Laurance *et al.*, 2014). This loss of biodiversity directly affects ecosystem services essential to agriculture, such as pollination, pest regulation, and soil fertility maintenance (Clark *et al.*, 2025; Stanley and Stout, 2013). Intensive agricultural practices can also contribute to soil degradation and increased erosion, undermining the long-term sustainability of production systems (Alegre and Rao, 1996).

In response to these challenges, sustainable land use management aims to reintroduce heterogeneity into agricultural landscapes in order to restore habitats and ecological interactions essential for agroecosystem functioning (Tresise *et al.*, 2021). Serving as field boundaries, hedgerows can play an important role in restoring biodiversity and bringing ecological life back into agricultural landscapes. Hedgerows are typically defined as boundary features between fields made up of trees or shrubs, generally extending more than 20 meters in length and less than 5 meters in width. They remain permanently vegetated, forming strips of trees or shrubs within grassland or cultivated landscapes (Kratschmer *et al.*, 2024).

### Development

Hedgerows have an important structural role in agricultural landscapes because they add heterogeneity to otherwise homogeneous landscapes and intensively managed areas. What makes them unique is their own microclimate, richer soil from crop fertilizer runoff, and greater exposure to wind and variable light conditions compared to adjacent fields. By forming semi-natural strips of vegetation, they create a habitat for many species of birds, small mammals, insects, and different plants and help connect fragmented patches of land, which facilitates the movement of plants and animals across farmland (Benton *et al.*, 2003). This connectivity supports biodiversity by making it easier for species to feed, reproduce and avoid predators, while also helping maintain ecological interactions in the landscape. In addition, hedgerows bring practical benefits to agriculture by reducing erosion, improving water retention and helping maintain soil fertility, which makes the land more stable and productive over time. They also contribute to the aesthetic value of agricultural landscapes for people and local inhabitants.

In a 2023 study in Brittany, France, researchers studied 40 hedgerows across farmland landscapes to assess their ecological impact. Hedgerows in dense, well-connected networks are called "bocage" landscapes, and they were found to be significantly more effective at supporting pollination, biodiversity and natural pest control than isolated hedgerows in fragmented landscapes. This is most likely due to greater habitat connectivity and environmental diversity (Boinot *et al.*, 2023). The results from this study show us that hedgerows do not work equally everywhere, their benefits depend on being part of a bigger policy-supporting network. At the site of the study, the traditional bocage landscapes have been partly dismantled by agricultural intensification. The ongoing destruction of hedgerow networks can have

negative effects for life on land, such as the risk of long-term and potentially irreversible loss of ecological functions and species, making restoration of these networks increasingly harder (Boinot *et al.*, 2023). What we can learn from this example is both the proven value of hedgerows when preserved and the urgent need for policies that are protecting the existing networks rather than allowing further fragmentation.

Furthermore, looking at a broader perspective, a global meta-analysis by Rey Benayas and Bullock (2021) shows that hedgerows have positive effects across diverse climates worldwide, from temperate regions in Europe to tropical landscapes. This is important because it means hedgerows are not just a local solution but a global one (Rey Benayas and Bullock, 2021). The same study also shows that farmland with hedgerows provided similar levels of biodiversity to natural habitat at field edges, but lower levels of ecosystem services than fully natural habitats. Hedgerows are therefore a compromise between maintaining farmland, necessary for food production, and preserving natural biodiversity.

A great number of areas could benefit from implementing hedgerow policies into their agricultural system, for example, tropical farmland which sustains a large share of the world's biodiversity, thus making them disproportionately important for global ecological stability (Laurance *et al.*, 2014). Since the 1990s, rapid population growth in tropical regions has significantly increased pressure on land and natural resources, driving widespread agricultural expansion and deforestation. This resulted in the large-scale conversion of natural habitats into farmland, fundamentally transforming tropical landscapes (Laurance *et al.*, 2014), and in habitat loss and fragmentation, which have become major drivers of biodiversity decline, especially affecting species with restricted geographic ranges, like endemic species (Laurance *et al.*, 2014). We know that the strength of the land-sparing effect will be greatest in those countries with the lowest subsidy levels, and it is indeed more evident in developing countries with a high food supply (Ewers *et al.*, 2009), but large areas of the tropics and most of Africa have relatively inefficient agriculture dominated by smallholders who lack access to modern agricultural technologies (Laurance *et al.*, 2014). In this case, hedgerows could provide significant benefits by naturally enriching the soil, improving nutrient retention, reducing erosion, and enhancing overall ecosystem stability within agricultural lands.

## **Conclusion**

The ongoing intensification of agriculture globally poses a threat to life on land. The implementation of hedgerow policies could be a solution to many of the issues encountered in large-scale monoculture farming. Hedgerows can lessen the effect of habitat fragmentation, ensuring that birds, mammals, and insects aren't isolated from potential food sources and can reproduce, feed, and move safely across the landscape. Hedgerows present a habitat to many species of animals and birds, with their own microclimate and habitat conditions like soil quality, water and light availability, and shelter.

Hedgerows also provide many benefits to soil structure and quality. This is especially relevant in the tropics, which are the most rapidly expanding areas of agriculture. In the tropics the soil is nutrient-poor and by removing the native forest, we significantly weaken an already fragile ecosystem. Hedgerows would act as an important safeguard against soil degradation by reintroducing a root system that stabilizes the soil.

## **AI statement**

We used AI/language models to compile some of the text, to create the background image for the poster, as a translator, and to reformulate sentences.

## Reference list

- Alegre, J., and Rao. (1996). Soil and water conservation by contour hedging in the humid tropics of Peru. *Agriculture Ecosystems & Environment*, 57(1), 17–25. [https://doi.org/10.1016/0167-8809\(95\)01012-2](https://doi.org/10.1016/0167-8809(95)01012-2)
- Benayas, J. M. R., Altamirano, A., Miranda, A., Catalán, G., Prado, M., Lisón, F., and Bullock, J. M. (2019). Landscape restoration in a mixed agricultural-forest catchment: Planning a buffer strip and hedgerow network in a Chilean biodiversity hotspot. *AMBIO*, 49(1), 310–323. <https://doi.org/10.1007/s13280-019-01149-2>
- Boinot, S., Alignier, A., Petillon, J., Ridet, A., and Aviron, S. (2023). Hedgerows are more multifunctional in preserved bocage landscapes. *Ecological Indicators*, 154, 110689. <https://www.sciencedirect.com/science/article/pii/S1470160X23008312>
- De León, D. G., Benayas, J. M. R., and Andivia, E. (2021). Contributions of Hedgerows to People: A Global Meta-Analysis. *Frontiers in Conservation Science*, 2. <https://doi.org/10.3389/fcosc.2021.789612>
- Ewers, R. M., Scharlemann, J. P. W., Balmford, A., and Green, R. E. (2009). Do increases in agricultural yield spare land for nature? *Global Change Biology*, 15(7), 1716–1726. <https://doi.org/10.1111/j.1365-2486.2009.01849.x>
- Forget, G., Carreau, C., Coeur, D. L., and Bernez, I. (2012). Ecological Restoration of Headwaters in a Rural Landscape (Normandy, France): A Passive Approach Taking Hedge Networks into Account for Riparian Tree Recruitment. *Restoration Ecology*, 21(1), 96–104. <https://doi.org/10.1111/j.1526-100x.2012.00868.x>
- IPBES. (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. <https://doi.org/10.5281/zenodo.3831673>
- Kratschmer, S., Hauer, J., Zaller, J. G., Dürr, A., and Weninger, T. (2024). Hedgerow structural diversity is key to promoting biodiversity and ecosystem services: A systematic review of Central European studies. *Basic and Applied Ecology*, 78, 28–38. <https://doi.org/10.1016/j.baae.2024.04.010>
- Laurance, W. F., Sayer, J., and Cassman, K. G. (2014). Agricultural expansion and its impacts on tropical nature. *Trends in Ecology & Evolution*, 29(2), 107–116. <https://doi.org/10.1016/j.tree.2013.12.001>
- Rey Benayas, J.M. and Bullock, J.M. (2021). Contributions of hedgerows to people: A global meta analysis. *Frontiers in Conservation Science*, 2. <https://www.frontiersin.org/journals/conservation-science/articles/10.3389/fcosc.2021.789612/full?ref=ecofriendlyhomestead.com>
- Stanley, D. A., and Stout, J. C. (2013). Quantifying the impacts of bioenergy crops on pollinating insect abundance and diversity: a field-scale evaluation reveals taxon-specific responses. *Journal of Applied Ecology*, 50(2), 335–344. <https://doi.org/10.1111/1365-2664.12060>
- Tscharntke, T., Klein, A. M., Kruess, A., Steffan-Dewenter, I., and Thies, C. (2005). Landscape perspectives on agricultural intensification and biodiversity – ecosystem service management. *Ecology Letters*, 8(8), 857–874. <https://doi.org/10.1111/j.1461-0248.2005.00782.x>
- Van Den Berge, S., Tessens, S., Baeten, L., Vanderschaeve, C., and Verheyen, K. (2019). Contrasting vegetation change (1974–2015) in hedgerows and forests in an intensively used agricultural landscape. *Applied Vegetation Science*, 22(2), 269–281. <https://doi.org/10.1111/avsc.12424>
- Yang, D., Luo, T., Lin, T., Qiu, Q., and Luo, Y. (2014). Combining Aesthetic with Ecological Values for Landscape Sustainability. *PLoS ONE*, 9(7), e102437. <https://doi.org/10.1371/journal.pone.0102437>