Green and blue infrastructure and farmland biodiversity: Optimizing CAP greening as conservation tool

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Introduction

Agricultural Intensification

Loss of Green and Blue Infrastructure (GBI): seminatural habitats and landscape features


Photo: Mario Diaz
To examine how the implementation of «greening» measures combined with other changes to Pillar 1 and Pillar 2 payments introduced by the latest round of CAP reform are impacting on GBI in a variety of farmed landscapes and in turn how the presence or absence (and spatial arrangement) of GBI affects biodiversity and ES.
Introduction

→ Non-linear relationships between landscape complexity and biodiversity that constraint the effectiveness of conservation measures


![Graph showing non-linear relationships between landscape complexity and biodiversity](image)

**1) Targeting**
- Conservation goals:
  - populations of rare or endangered species
  - overall biodiversity
  - associated ecosystem services

**2) Considering requirements of targets**
- Field and landscape elements or traits:
  - food and cover within fields
  - hedges, fallows, woodland, uncultivated areas, open matrix
  - mixed land-uses, small vs. large patches

**3) Considering landscape constraints**
- Definition of landscape complexity levels and thresholds according to the regional context and targets’ requirements

**4) Adapting policy tools to landscape constraints**
- Simple Greening
- Intermediate Greening, AES
- Complex HNVF

**5) Systematic evaluation and learning process**
- Assessment of the ecological effectiveness of conservation measures: paired or BACI designs in parallel to scheme development
Methods

6 CASE STUDY AREAS (Spain, Germany & Bulgaria) x 15-25 PLOTS (25 ha – 500 m x 500 m)

- Extensive mixed farming
  - Plovdiv
  - Pazardjik
- Extensive cereal farming
  - Castilla-La Mancha (SP)
- Intensive arable farming
  - Tauberbischofsheim (GE)
- Intensive mixed farming
  - Plovdiv-Pazardjik (BU)
- Extensive pasture
  - Stara-Planina (BU)
- Extensive wood pasture (Dehesa)
  - Extremadura (SP)
Methods

→ HABITAT (GBI) – BIODIVERSITY

Habitat features & biodiversity (birds & plants) within plots (25 ha – 500 m x 500 m)

GBI included in «greening»:

- Small scale landscape elements:
  1. Isolated trees
  2. Tree groups and field copses
  3. Ponds

- In field elements:
  4. Permanent grasslands and pastures
  5. Short rotation coppices
  6. Agroforestry (dehesa) and orchards (olive groves, vineyards and fruit trees)
  7. Catch-crops or green cover
  8. Nitrogen fixing crops (legumes)
  9. Land lying fallow (covered or ploughed)

- Connectivity features:
  10. Buffer strips and strips along forest edges
  11. Field margins and grassy strips
  12. Hedges and woody strips
  13. Trees in lines
  14. Walls
  15. Ditches
  16. Terraces

- Maintain/manage natural elements
  18. Wetlands
  19. Flood plains
  20. Environmental sensitive pastures
  21. Shrubland and moorland

Photo: Mario Díaz
Methods

→ HABITAT
Mapping of habitat features within plots (25 ha – 500 m x 500 m) and subsequent contrast in field

→ BIRDS
5 count points (100 m radius, 5 minutes, 3 visits)

→ PLANTS
4 transects (30 m length, 2 m wide)
Isolated trees

Arable (GE): + Plants & threat. birds
Mix. farm. (GE): + Plants & all birds
  - Farm. birds
  - Threa. birds

Cereal (SP): + Plants & all birds
  - Threat. farm. birds

Dehesa (SP): + Plants
  - Farm. & steppe birds

Pasture (BU): + Plants
  - Threat. farm. & steppe birds

Tree groups

Cereal (SP): + All & threat. birds
Arable (GE): + All & steppe birds
  - Plants

Mix. farm. (BU): + All, threa. & farm. birds
  - Plants

Pasture (BU): + All birds
  - Threat. farm. & steppe birds

Ponds

Dehesa (SP): + Farm. birds
Results

→ Valuable GBI:

IN FIELD ELEMENTS

N-fixing crops

Cereal (SP): + Plants & Threat. farm. birds

Cereal (SP): + All, threat. & farm. birds

Arable (GE): + Farm., steppe & threat. birds

Mix. farm. (BU): + Plants & all birds
- Farm. & steppe birds

Pasture (BU): + All birds
- Farm. birds

Fallow land

Cereal (SP): + Thre. Farm. birds

Dehesa (SP): + Farm. steppe birds

Mix. farm. (GE): + Plants & steppe birds

Arable (GE): + Steppe birds
- Plants

Mix. farm. (BU): - All birds
+ Threat. Farm. steppe birds

Pasture (BU): - Threat. Farm. birds

Grassland

Cereal (SP): + Thre. Farm. birds

Dehesa (SP): + Farm. steppe birds

Mix. farm. (GE): + Plants & steppe birds

Arable (GE): + Steppe birds
- Plants

Mix. farm. (BU): - All birds
+ Threat. Farm. steppe birds

Pasture (BU): - Threat. Farm. birds
Results

→ Valuable GBI:

**IN FIELD ELEMENTS**

**Permanent crops**

- Mix. farm. (BU) + All, threat. farm. birds

- Cereal (SP) + All & threat. birds
  - Farm. birds

**Catch or cover crops (cereal)**

- Mix. farm. (BU): + Threat., Farm. & steppe birds

- Arable (GE): + Threat., Farm. & steppe birds

- Mix. farm. (GE): + Farm. Birds
  - All birds

Photos: Mario Diaz
Results

Valuable GBI:

CONNECTIVITY FEATURES

Grassy strips
Mix. farm. (BU):
+ Plants, all, farm. & threat. birds
Pasture (BU): + All birds
Arable (GE):
+ Threat., Farm. & steppe birds
Mix. farm. (GE): + Farm. birds
- All birds

Woody strips
Arable (GE): + All birds
Mix. farm. (GE): + Farm. birds
Dehesa (SP): + Threat. birds
Cereal (SP): + All & threat. birds
- Farm. birds
Mix. farm. (BU): + Threat. Farm. birds
- Plants
Pasture (BU): + Threat. Farm. birds
- All birds

Photos: M. Díaz
Results

Valuable GBI:

SEMINATURAL ELEMENTS

Shrubland
Mix. farm. (BU) + Plants & all birds

Photo: Adhara Pardo

Crop diversification
Cereal (SP) + Plants
- Threat. Farm. birds
Mix. farm. (GE) + Steppe birds
- All birds & plants
Pasture (BU) + Steppe birds
- All birds

Photo: Antonia Schraml

Crop size reduction
Cereal (SP): + Threat. Farm. birds
Arable (GE):
+ All & steppe birds
Mix. farm. (GE): + Plants & farm. birds
- Steppe birds
Pasture (BU): + Plants, threat. farm. & steppe birds
- All birds

Photo: Mario Díaz
Conclusions

→ Highly variable/mixed relationships between different GBI elements and biodiversity among regions, systems and groups of organisms

→ TARGETS:
  Overall plant or bird diversity vs. threatened farmland specialist?
  Contrasting responses to trees and woody features

→ Conservation measures based on targets’ requirements

→ Conservation measures in Next CAP programming period (2021 -2028):
  Cross-compliance + Greening (pillar 1) + AES (pillar 2)
  Environ. conditionality + Eco-schemes (pillar 1) + AES (pillar 2)

→ Non-linear relations constraint the effectiveness of conservation measures
  Less GBI effects in more extensive (complex) systems (e.g., mixed farming in GE, pastures in BU and dehesas in SP)

→ High variability and non linearity complicate the prediction of actual benefits of conservation measures

→ Performance monitoring & Adaptive management

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