Mitigating biodiversity loss on farmland: are strategies developed in the West effective in the East?

David Kleijn
Agri-environment schemes

• Apart from protected areas, the most important tool to counteract biodiversity decline in Europe

Characteristics

• Agri-environmental programs differ between countries
• Participation voluntary, for periods of five years
• Farmers are stimulated to conserve or promote biodiversity
• Farmers are financially compensated for loss of income
• c. 25% of EU’s farmland under agri-environment schemes
• Current costs: c. € 5.75 billion annually
No improvement of plant biodiversity in ditch banks after a decade of agri-environment schemes
Helena M. Blomqvist\textsuperscript{a,b}, Wil L.M. Tamis\textsuperscript{b,*}, Geert R. de Snoo\textsuperscript{b}

Diversity of flower-visiting insects: effects of organic farming system, landscape context
7SCHUH,* INGOLF STEFFAN-DEWENTER,*

Effects of agri-environment schemes on plant diversity
Concepción M. Concepción-Moreno

Mountain grassland biodiversity: Impact of site conditions versus management type
D. Kampmann\textsuperscript{a,b,*}, F. Herzog\textsuperscript{a}, Ph. Jeanneret\textsuperscript{a}, W. Konold\textsuperscript{b}, M. Peter\textsuperscript{a}, T. Walter\textsuperscript{a}, O. Wildi\textsuperscript{c}, A. Lüscher\textsuperscript{a}

Wildlife-friendly farming benefits rare birds, bees and plants
Richard F. Pywell\textsuperscript{1,*}, Matthew S. Heard\textsuperscript{1}, Richard B. Bradbury\textsuperscript{2}, Shelley Hinsley\textsuperscript{1}, Marek Nowakowski\textsuperscript{3}, Kevin J. Walker\textsuperscript{1,4} and James M. Bullock\textsuperscript{1}

Landscape-scale responses of birds to agri-environment management: a test of the English Environmental Stewardship scheme
David J. Baker\textsuperscript{1*}, Stephen N. Freeman\textsuperscript{2}, Phil V. Grice\textsuperscript{3} and Gavin M. Siriwardena\textsuperscript{3}

Countryside stewardship delivers cirl buntings (Emberiza cirlus) in Devon, UK
Will J. Peach\textsuperscript{4*}, Lucy J. Lover\textsuperscript{1}, Simon R. Wotton, Cath Jeffs

grassland specialist and generalist beetles to management and landscape complexity
Péter Batáry\textsuperscript{4*}, András Báldi\textsuperscript{2}, Győző Szél\textsuperscript{1}, Attila Podlussány\textsuperscript{1}, István Rozner and Sarolta Erdős\textsuperscript{1}
Effects on the most frequently observed species; $n = 23$

- Meadow Pipit
- Bl.t. Godwit
- Lapwing
- Oystercatcher
- Redshank
- Mallard

Species

Mean # territories per field

- Management agreement
- Conventional

Organic farming in Germany

(b) Number of bee species

(d) Number of flowering plant species

(f) Flower cover %

% Crop fields
Farmland bird schemes in the UK

Potential effects highest where rate of biodiversity change is highest
Landscape structure moderates effects of schemes

Kleijn, Rundlöf, Scheper, Smith & Tscharntke. 2011. TREE, 26, 474-481.
The extent to which conservation improves the habitat for biodiversity ("ecological contrast") influences the effectiveness of measures.
Effectiveness = difference between measure and conventional
Conservation benefits for bees are higher in Switzerland (CH).....but species richness is higher in Hungary (Hu)!

Batary et al. 2010 AGEE, 136, 35–39
Mitigating biodiversity loss on farmland: insights from the West make mitigation strategies in the East more effective
Redistribution of resources over the farm
Conservation efforts are neutralized by developments in conventional farming
Trends in scheme uptake and black-tailed godwit population numbers

Sources: SOVON, unpublished results; PBL, 2008
Time

Socio-economic & Technological developments

Mitigation
Effectiveness = difference between measure and conventional
Most positive effects are observed in landscapes where conventionally farmed fields are virtually devoid of resources.
Table 2 Mean species richness and abundance of species listed in national Red Data books on fields with agri-environment schemes and paired conventionally managed fields in five European countries.

<table>
<thead>
<tr>
<th></th>
<th>Germany AE</th>
<th>Control</th>
<th>Spain AE</th>
<th>Control</th>
<th>Switzerland AE</th>
<th>Control</th>
<th>The Netherlands AE</th>
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<td>Species richness</td>
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<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>0.1</td>
<td>0</td>
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<tr>
<td>Cover (% total cover)</td>
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<td>0.1</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>0.2</td>
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<tr>
<td>Species richness</td>
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<td>0</td>
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<td>8.1</td>
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<td><strong>Birds (numbers/ha)</strong></td>
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<tr>
<td>Species richness (counts)</td>
<td>0.11</td>
<td>0.13</td>
<td>0.57</td>
<td>0.51</td>
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<td>1.01</td>
<td>1.07</td>
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<td>Abundance (counts)</td>
<td>0.30</td>
<td>0.36</td>
<td>3.61*</td>
<td>2.75</td>
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<td>0</td>
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<td>Species richness (territories)</td>
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<td>0.08</td>
<td>0.34</td>
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<td>Abundance (territories)</td>
<td>0.05</td>
<td>0.10</td>
<td>0.82**</td>
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<td>0</td>
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<td>0.60</td>
<td>0.37</td>
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</table>

* P<0.05, ** P<0.01

Regular farmland does not host many rare species and general schemes do rarely enhance many endangered species

*Kleijn et al. 2006 Ecol. Let. 9: 243-254*
SO WHAT?!
Biodiversity problems on farmland in ‘the East’
• Abandonment and Intensification

Traditional agri-environmental approaches: Paying to farm in traditional ways
• Old versus young
• Technological advances
• Within farm redistribution of resources

Farmland outside agri-environment schemes changes
• Affects impact of management
Nothing ever stays the same
The only long-term sustainable solution to preserve farmland biodiversity is to make it part of the farming system (again)
A key flaw in agri-environment schemes is farmer motivation

“Voluntary agri-environmental work returns little symbolic capital to farmers as, by prescribing management practices and designating specific areas for agri-environmental work, such schemes fail to allow farmers to develop or demonstrate skilled role performance” (Burton et al. 2008 Sociologia Ruralis, 48, 16-37)

Farmers with agri-environment schemes rarely consider how actions on the conventionally farmed parts of the farm affect biodiversity.
Enhancing pollinators on highbush blueberry farms in Michigan, USA
Rufus Isaacs and colleagues
Pollination ecosystem service – costs and revenues

Fruit set and berry weight values used to estimate blueberry yield

Costs and revenues: 2 acre habitat adjacent to 10 acre blueberry field

Estimated yield per acre (lbs.)

- Grass
- Flower

Edge
Interior

F = 4.87, P = 0.029
F = 0.74, P = 0.39

Yield

Dollars/acre of crop

- cumulative cost
- cumulative 50% subsidized cost
- cumulative revenue

Year

F = 4.87, P = 0.029
F = 0.74, P = 0.39

Isaacs et al. in prep
EU Biofuel policy

UK, Finland and Latvia, Estonia, Lithuania: Honeybees provide less than 25% of the required pollination services

*Tom Breeze, Simon Potts et al. in prep.*
More bottom-up!

We have to hand farmers the knowledge to make them motivated to conserve biodiversity.

Quantify the benefits and costs of ecosystem services.

Link management and biodiversity to yield and farm income.
Improve (cost-) effectiveness of measures mitigating biodiversity loss

- Internalize functional biodiversity in farming systems
- Provide farmers with economic evidence (ecologists!)
- Use functional biodiversity to raise interest in nature conservation with farmers
Improve (cost-) effectiveness of measures mitigating biodiversity loss II

- Functional biodiversity → cross-compliance (CAP)

- Vulnerable biodiversity → agri-environment schemes
Thanks for listening

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EU-FP5 - EASY
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Dutch Ministry of Economic Affairs, Agriculture and Innovation
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Geerdien van der Hijden
Hugh Jansman
Gerard Müskens
Ruben Smit
David Kleijn
World-wide web
A comparison of all plant species encountered on 65 extensively farmed fields and on 65 intensively farmed fields

Kleijn, Rundlöf, Scheper, Smith & Tscharntke. 2011. TREE, 26, 474-481.