Effects of ecological compensation areas on species diversity in the Swiss grassland - an overview

Walter T. 1, Herzog F. 1, Birrer S. 4, Dreier S. 1, Hunziker M. 1, Jeanneret Ph. 1, Lüscher A. 1, Peter B. 2,1, Pfiffner L. 3 and Spiess M. 4

1 Agroscope FAL Reckenholz, Swiss Federal Research Station for Agroecology and Agriculture, CH-8046 Zurich, Switzerland
2 Agrofutura, CH-5070 Frick
3 Research Institute of Organic Agriculture, CH-5070 Frick
4 Swiss Ornithological Institute, CH-6204 Sempach

Abstract

Forty percent of Switzerland is comprised of agricultural grassland. Due to this large area and the strong effect of management intensity on biodiversity, grassland management is crucial for species richness of the entire country. In 1993, an agri-environmental program to reverse species decline was implemented by the Swiss government. To date, 100,000 ha of meadows and pastures are managed as ecological compensation areas (ECA). The results of investigations to quantify the effects of ECAs on the species diversity of plants, birds and arthropods are summarised. Plant species richness in ECA litter meadows is satisfactory, whereas it is deficient for ECA hay meadows. Whereas the effect on birds is positive or negative, depending on the guilds, while it is mostly positive for butterflies, grasshoppers, carabid beetles and spiders. The results indicate that the measures are only partially successful in enhancing or conserving floral and faunal species richness.

Keywords: ecological compensation, grassland, biodiversity, agri-environmental program

Introduction

In 1993, an agri-environmental program was introduced by the Swiss government with the aim to reverse species decline. Within this program, the farmer needs to manage at least 7% of the farm’s utilised agricultural area (UAA) in accordance with rules laid down for ecological compensation areas (ECA). In return the farmer will receive basic payments per year and per hectare. The ECA – types and rules concerning grassland are listed in table 1 (Günter et al., 2002). In 2002, ECAs covered 115,000 ha (11.2% of the UAA in Switzerland), of this 92% of the area is grassland. The aim of this paper is to give an overview of results showing effects of ECAs on biodiversity in grassland. Most results have been elaborated within the evaluation programme launched by Agroscope FAL Reckenholz in 1996. The main-objective is to answer the following questions: What is the effect of ECAs on bird and plant species at the large regional scale in the Swiss Plateau? What is the effect of ECAs on the assemblages of plants, birds, spiders, ground beetles, butterflies and grasshoppers in three case study areas of 6 km² each? The methods to assess the effects of ECAs are given in Dreier et al. (2002, 2004) for plants, Spiess et al. (2002) and Dreier et al. (2004) for birds, Jeanneret et al. (2004) for spiders and butterflies, Peter and Walter (2001), Walter et al. (2004) for grasshoppers and in Pfiffner and Luka (2000) for ground beetles.

Results and discussion

Plants: From 1401 vegetation relevés undertaken within the Swiss plateau region, only 26% of the extensively used ECA meadows and 13% of the low input ECA meadows fulfilled the criteria for the desired botanical quality by the ECO-quality ordinance (Dreier et al., 2002).
By way of contrast, a more satisfactory result was established for the ECA litter meadows where 85 % met the criteria.

Birds: Surveys that examined the presence of 39 indicative species were undertaken on the Swiss plateau in 23 locations ranging in area between 5 and 10 km². Significant higher density of territories around ECAs than expected were found for Yellowhammer (*Emberiza citrinella*), Red-backed Shrikes (*Lanius collurio*), Whitethroats (*Sylvia communis*), Marsh Warblers (*Acrocephalus palustris*) and Green Woodpeckers (*Picus viridis*). The contrary was established for Skylarks (*Alauda arvensis*). The remaining species were too rare to allow a statistical analysis. The average density of indicative bird species was found to be very low at 14 species per km² (Spiess *et al*. 2002). ECAs were found to increase the territories of species that require a landscape mosaic of hedges, woodland fringes and grassland. Species which require extensively used open areas were found to be less frequent near ECAs.

<table>
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<th>ECA type</th>
<th>Regulations and supplementary subsidies</th>
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| Extensively used meadows (40.1 %) | - Size: ≥ 0.05 ha, duration of contract: ≥ 6 years  
- Mowing is compulsory, no fertiliser applications  
- Specific punctual herbicide treatment against problematic weeds is possible if mechanical control is insufficient  
- Mowing at least once a year, no earlier than indicated for the respective production zone (e.g., for lowlands 15th June)  
- Only mowing, no grazing except for the last use in autumn (e.g., for lowlands no earlier than 15th September)  
- Use of officially certified seed mixtures for creation of new meadows  
- Supplementary subsidies 450-1500 CHF ha⁻¹ y⁻¹ |
| Extensive pastures (5.7 %) | - Size: ≥ 0.05 ha, Duration of contract ≥ 6 years, grazing at least once a year  
- No fertilisation apart from manure of grazing animals  
- Only punctual herbicide treatments  
- No areas dominated by ubiquitous nutrient indicators  
- No supplementary subsidies |
| Wooded Pastures (1.7 %) | - As extensive pastures. Specific fertilisers (no free nitrogen) and application of plant treatment products may be granted by cantonal forest authorities  
- No supplementary subsidies |
| Low input meadow (32.2 %) | - Solid manure and compost are allowed but should not exceed 30 kg N ha⁻¹ y⁻¹  
- All other regulations as for extensively used meadows  
- Supplementary subsidies 300-650 CHF ha⁻¹ y⁻¹ |
| Litter meadows (5.7 %) | - Size: ≥ 0.05ha, Duration of contract: ≥ 6 years  
- No fertilisers and plant treatment products  
- Mowing once a year after 1st September, litter has to be removed  
- Supplementary subsidies 450-1500 CHF ha⁻¹ y⁻¹ |

Butterflies: During a case study undertaken in Ruswil (20 km NW of Lucerne) in 1998, 2000 and 2002, only 3 to 4 butterfly species were observed on average in both, ECAs and conventionally managed meadows. With the exception of the results from 1998 (Jeanneret *et al*., 2004.), no significant differences were found between the meadow types. By way of contrast, Bosshard and Kuster (2001) observed between 16 and 23 species three years after sowing a meadow with an ECA seed mixture. Thus, some regions are in a disastrous situation with no visible sign of improvement whilst in other regions freshly sown meadows attract comparatively high numbers of species.

Grasshoppers: In the canton of Zurich, two case studies were undertaken in 1990 and 2000 in order to compare grasshopper populations. A significant increase in the distribution area of grasshoppers was observed in ECAs for 11 of the 20 grasshopper species. Both studies
showed the importance of already existing species rich areas as a source for the repopulation of ECAs – in this cases small, legally protected nature conservation areas. In one study, the time since the area is managed according to the ECA-management directives was also found to be important (Peter and Walter, 2001; Walter et al., 2004). The remarkable increase of the distribution area of threatened grasshopper species due to ECA-meadows is very encouraging. Furthermore, the results support the argument to place ECA near already existing species rich areas.

Ground beetles: No differences in species richness were found between ECA and conventionally managed meadows. However, ECA meadows supported more specialised species and three times more individuals of threatened species (Pfiffner and Luka, 2000). Hence, ECA meadows seem to have a positive effect by supporting threatened ground beetles.

Spiders: In a case study undertaken in Ruswil in 1997, no difference in species number of spiders between ECA and conventionally managed meadows was found. However, species assemblages were observed to be significantly different (Jeanneret et al., 2004). ECA meadows thus lead to an enrichment of regional spider assemblages although a benefit of ECAs for rare or threatened species has not yet been observed.

Conclusions and reaction of research and policy

The results of the eight-year projects suggest that, although the measures of the agri-environmental program are heading in the right direction, further efforts are still necessary to increase biodiversity in agricultural areas. The policy makers’ reaction on these ambivalent results was the adoption of the ‘ECO-quality ordinance’ in 2001 by the Swiss Government. It aims to increase the quality of ECAs. The ordinance includes incentives for defined quality criteria and incentives for constructing ECA networks aimed at target species. There is also a shortage of information about the effect of ECAs on biodiversity in the alpine region and within pastures. Research is now being undertaken to define quality criteria for extensively used pastures and new ECA elements. The national research foundation has initiated the program ‘Landscape and Habitats of the Alps’ which includes projects that examine the effect of ECAs on biodiversity.

References


