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A Credit Point System for assessing and enhancing biodiversity at the farm scale – and beyond

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Introduction

Over the past decades, farmland biodiversity has decreased drastically in many European countries, and Switzerland is no exception. There have been attempts to halt and reverse this decline for over 20 years. The Swiss government spends 2.8 bn Swiss Francs annually on subsidy payments for agriculture. Ca. 8% is expended on ecological compensation areas (ECAs), the official options of the Swiss agri-environmental scheme (AES). Despite these efforts, no general increase of biodiversity has been observed at the national level.

On-farm experience shows that many farmers are interested in promoting biodiversity on their farms. However, a lack of knowledge transfer on ecology and agri-environmental issues seem to hinder farmers from managing their land in a more wildlife-friendly manner.

Enhancing farmland biodiversity has often been initiated at the plot level, although the principle unit of decision making in agriculture is the farm, and decisions on promoting biodiversity are also taken at that level.

We thus focused on the farm level and developed a tool which assesses on-farm biodiversity as a whole. With this tool, farmers are rewarded credit points for their efforts for biodiversity.

Materials and Methods

The Credit Point System

The Credit Point System (CPS) helps farmers with the assessment of biodiversity-promoting measures on their land. The CPS combines quantity and ecological quality of over 30 options known to enhance farmland biodiversity. Farmers can score points by applying some of these measures. Most of the listed options are official ECAs from the Swiss AES. Further, a number of arable and grassland options also yield points (for details see Birrer et al. 2014). The CPS weights the options according to their known benefit for biodiversity, i.e. a larger-sized meadow will yield more points than smaller ones and meadows with a high ecological quality (according to the Swiss 'quality scheme') yield more points than those without. The weighting is based on results of studies addressing, amongst others, farming intensity, landscape and habitat heterogeneity, conservation measures for target species etc., and is complemented with expert knowledge. The CPS returns one total biodiversity score for each farm (CPS score).

Evaluation of the Credit Point System

We tested whether the CPS score correlated with biodiversity using four organism groups: vascular plants, butterflies, grasshoppers and breeding birds. These biodiversity indicators and the CPS scores were assessed on 133 farms in the Swiss lowland. 42 farms were certified organic, 80 were integrated farms (integrated production according to the farming organisation IP-SUISSE) and 11 were conventional holdings.

For each of the four organism groups, species richness and density were examined, both for all species found and for a subset of species mainly occurring or depending on farmland (henceforth "farmland-specialist species").

Correlations between biodiversity measures (e.g. plant species richness, farmland butterfly density etc.) and the CPS score were analysed with generalised linear mixed models. A range of environmental variables which are likely to influence biodiversity, but cannot be 'changed' by farmers, were added (e.g. farm area, proportions of arable land and adjacent woodland etc.) to test the CPS score in a realistic context.

Results and Discussion

Species richness and density of plants, grasshoppers, butterflies and birds significantly increased with CPS score. Correlations with farmland-specialist species were also significantly positive (see for instance farmland plant species richness, Figure 1). The CPS was thus shown to reflect biodiversity and to be a suitable proxy of biodiversity at the farm scale.

The most readily available proxy for biodiversity efforts at the farm scale would be the proportions of ECAs, as these are already assessed and officially registered. In our evaluation, however, the CPS score performed better than mere proportions of ECAs. The weighting of quantity and ecological quality in the CPS helps to better predict farm-scale biodiversity. Moreover, the CPS can be used as a self-evaluation tool with which farmers can assess their current biodiversity CPS score and also run scenarios on how to further promote biodiversity on their land. This in turn increases their motivation and self-initiative, a prerequisite for sustainable conservation of farmland biodiversity.

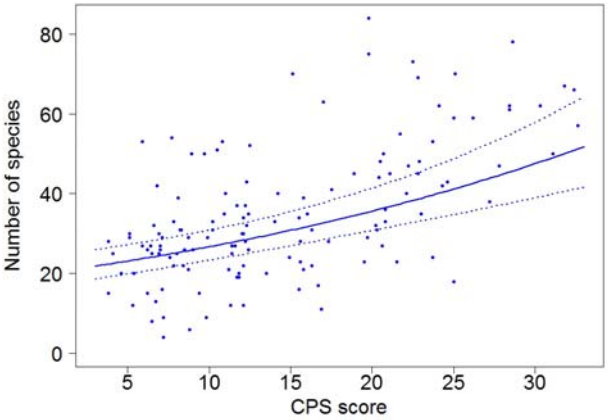

Figure 1. Relationship between the CPS score and species richness of farmland-specialist plants. Shown is regression line incl. 95% credibility intervals (dotted lines). The raw data is plotted as dots. N = 133 farms.

In 2010, a farming organisation for sustainable and wildlife-friendly foods, IP-SUISSE (integrated production; www.ip-suisse.ch), set up a mandatory guideline for the enhancement of biodiversity on their producers' farms. Since then, it has become mandatory for those ca. 9000 farms to apply the CPS and reach a minimal CPS score in order to remain in the label programme. Meanwhile, CPS scores on those farms have markedly increased (Figure 2).

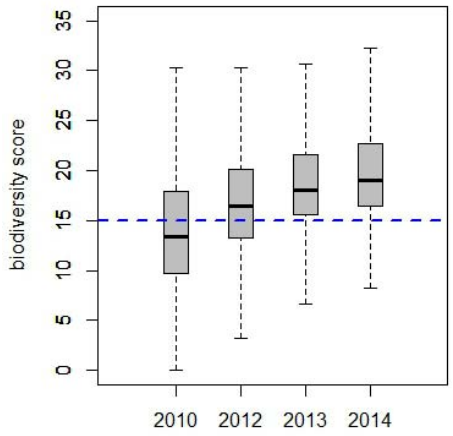

Figure 2. Increase of CPS scores (biodiversity score) of IP-SUISSE label producers (N varying annually; 2010: 5860, 2014: 8633 farms). By 2014, 88% reached the required minimal biodiversity CPS score (hatched line).

Already between 2010 and 2012 farmers implemented additional habitats (mostly ECAs) for biodiversity to reach the mandatory minimal CPS score. Not only the quantity but especially the ecological quality of those habitats was higher in 2012 than at the outset in 2010 (Table 1). In total, the area of high-quality options was increased by ca. 43% to nearly 88 km^2.

Table 1: Implemented high-quality CPS options and their area (km2) before (2010) and after the introduction of the CPS by IP-SUISSE in 2012 (n = 4852 farms with data from 2010 and 2012).

CPS options	Area (km2) 2010	Area (km2) 2012
High-quality meadows	51.4	75.6
Wildflower areas	7.1	7.6
High-quality hedgerows	1.9	3.1
Other	1.2	1.6
Total high-quality area	61.6	87.9

For IP-SUISSE, it was a challenging goal to raise the awareness of their producers for biodiversity. A few hundred farms dropped out of the programme, but the majority has increased its biodiversity efforts. This process has taken time, and advisory support was claimed by many farmers to make the necessary adjustments on their farms.
Ca. 15% of Swiss farms produce foods according to IP-SUISSE guidelines. They manage 25% of the Swiss farmland (2600 km^2). Improved biodiversity efforts on these farms therefore contribute to the ecological improvement of a substantial part of the Swiss farmland.

Conclusions

The Credit Point System is a suitable tool to assess biodiversity at the farm scale. The resulting CPS score reflects biodiversity efforts made by farmers on their land.
The CPS as an assessment tool and the uptake of biodiversity directives in a label programme for sustainable and wildlife-friendly foods have opened up new perspectives towards promoting farmland biodiversity at a large scale.

Acknowledgments

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