The credit point system: an innovative approach to enhance biodiversity on farmland

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Summary

We developed a credit point system to assess "wildlife-friendliness" at the farm scale. Farmers can choose and gain points from 32 habitat management options, most of which account for quantity, quality and spatial distribution of ecological compensation areas (options of the Swiss agri-environment scheme). Additionally, points can be scored by specific arable and grassland measures. Farmers are free to decide which measures to implement. We evaluated the credit point system on 133 farms (2009–2011) in the Swiss Lowland Plateau. Occurrence and density of plants, grasshoppers, butterflies and farmland birds were recorded on these farms as biodiversity indicators. The scored points were positively correlated with the majority of biodiversity indicators. IP-Suisse, the Swiss organisation of integrated agricultural production, incorporated the credit point system into their production guidelines in 2009. All its producers have to reach a defined point score until 2013. As a consequence, two thirds of the involved farmers had to increase their ecological performance. This initiative also put pressure on their organic farming colleagues to reform their guidelines in order to fully exploit their high potential of biodiversity. The products from the farms are labelled by a major retailer as wildlife-friendly and are well-received by consumers. Farmers benefit from bonus payments from the retailer and an enhanced public image. Therefore, the credit point system helps to substantially improve farmland biodiversity. Our results provide evidence that wildlife-friendly farming can create a "win/win situation" for farmers and nature, even in intensively managed regions in the Swiss Lowland Plateau.

Key words: Biodiversity, agri-environment, credit point system, wildlife friendly farming, label production, advisory

Introduction

Over recent decades, farmland biodiversity has decreased drastically due to agricultural intensification (Benton *et al*., 2003; Robinson & Sutherland, 2002). To reverse this negative trend, agricultural practices must become more wildlife-friendly. On a political level, agri-environment schemes (AESs) have to be targeted and tailored to increase the outcome for biodiversity (Moreddu, 2007; Perkins *et al*., 2011).

In addition, production and management processes have to be optimised as well. Successful implementation of adaptive measures often fails because farmers are overwhelmed by the ecological complexity and administrative burdens. Often farmers neither know about the value of their services for farmland biodiversity, nor do they have a tool to assess efforts for biodiversity

on their land. Furthermore, ecological compensation payments (state subsidies) are, or often seem, not attractive enough to be competitive with intensive farming. A promising strategy to halt biodiversity loss could be to provide additional economic incentives that guarantee an outlet for wildlife-friendly products. Thus, to ensure continuity of wildlife-friendly agricultural practices in the long run, economic incentives for added values, such as biodiversity, must be provided to farmers by market partners. Intensifying advisory support for farmers could also help them to improve their performance for biodiversity.

A few farmer organisations and retailers consider wildlife-friendly production a competitive business strategy (www.conservationgrade.co.uk, www.ipsuisse.ch). In some European countries, there is a rising demand for high-quality goods produced locally and by environmental-friendly means, for which consumers are willing to pay higher prices. However, objective criteria which guarantee the effectiveness of the promised added values are rarely implemented in production guidelines (van Amstel *et al*., 2007). Filling this gap is a major challenge for stakeholders of the agricultural and agro-industrial sector, as well as for agro-ecologists and economists. This paper presents preliminary results from on-going projects that combine the development, implementation and evaluation of practical tools to improve biodiversity at the farm scale.

Materials and Methods

Credit point system: Development and evaluation

To easily measure wildlife-friendliness at the farm scale, we designed the "Credit Point System" (CPS). This expert knowledge-based tool is designed as a form to fill in all efforts promoting biodiversity at farm scale. Farmers can "score points" by applying 32 options. The amount of ecological compensation areas (ECAs; options of the Swiss agri-environment standard scheme, Schweizerischer Bundesrat, 1998) above the 7% of farmed area required to qualify for federal subsidies are one substantial part of the credit point score. The same is true for "ecological quality" as defined by federal regulations ("quality scheme"), size and spatial distribution of those ECAs. Further, points are given for grassland (e.g. staggered mowing) and in-field options on arable land (e.g. undrilled patches, unsprayed areas), as well for the conservation of genetic diversity (heritage breeds/heirloom crops). A detailed handbook of the CPS is available online (http://www.vogelwarte.ch/MVP). In the CPS, a variety of factors are accounted for, for example, farm size, land-use (amount of arable *vs* grassland) and production zone (lowland vs. upland). Moreover, the scores are weighted according to their known (previously analysed) benefit for biodiversity, i.e. larger-sized meadows will yield more points than smaller ones and meadows with ecological quality (according to "quality scheme") more than those without. After filling in the CPS, a point score is returned which is a proxy for all biodiversity efforts made at a given farm.

The CPS is currently evaluated by the Swiss Ornithological Institute and the Research Institute of Organic Agriculture FiBL in the long-term project "Scoring with biodiversity – farmers enrich nature". We analysed whether the obtained score really is an accurate proxy for biodiversity at the farm scale. From 2009–2011, data were collected on a total of 133 farms located in the lowland and hill production zones below 800 m a.s.l in the Swiss Plateau. Average farm size was 24.6 ha (±4.3 ha), which corresponds to the national average. The farms all covered arable and grassland (mixed) farming, with an average arable proportion of 39.7% (±17.1%). Forty-two farms were certified organic, 80 were integrated farms (integrated production) and 11 farms were conventional farms. To minimise edge and environment effects, the farms had to be as spatially consolidated as possible, a feature relatively difficult to find in Swiss lowland farms.

Data collection and analysis

The credit point system (CPS) was filled in on the farms and a CPS score was obtained for each farm. We mapped type, size and quality of all ECAs, along with crop types and semi-natural habitats. Plants, grasshoppers and butterflies were counted along transects (total 2.5 km per farm). Birds were monitored during three visits on the entire farm area.

Species richness and density were used as biodiversity measures. Species richness was defined as the total number of observed species per organism group (plants, grasshoppers, butterflies, birds). As a second set of response variables, we calculated an index of species density at the farm level. Species richness and density were analysed at three levels: All recorded species, species of special conservation concern (according to the Environmental Objectives for the Agriculture Sector, EOAS; 731 listed plant species, 48 grasshopper species, 140 butterfly species and 47 bird species, BAFU & BLW, 2008) as well as species on the Red List. Due to their scarcity, occurrence was calculated instead of richness/density for the Red List species. Combining four organism groups with three species subsets (all species / EOAS species / Red List species) and species richness, density and occurrence for Red List species, we obtained 19 different biodiversity indicators as dependent variables.

Generalised linear mixed models were used to analyse relationships between the biodiversity measures and the CPS. For each response variable (biodiversity indicator), a basic model was built in which all environmental/background variables were included, independent of their significance. These background variables were: year, region, farm type, temperature level, area, consolidation, proportion of arable land, proportion of lay grass, livestock unit, woodland, settlement and trees. In a second step, the point score was added to the variables. These expanded models were compared with the basic model, and the difference in AIC values (ΔAIC) was calculated. A difference of at least -2 indicated that the expanded model fitted the data better than the basic model. For details, we refer to Birrer *et al*. (in prep.).

Whole-farm advisory

To investigate whether a whole-farm advisory service encourages farmers to implement additional and especially more targeted measures for the benefit of biodiversity, we advised 24 farmers. Advisors provided whole-farm solutions optimising ecological and economic aspects for individual farms, ensuring that only locally adapted measures were taken which would efficiently contribute to biodiversity. For this, we developed a second tool, the "system of characteristic and site-specific farmland species" (Graf *et al*., 2010). It supports farmers in choosing suitable management options for target and character species to enhance the autochthonous fauna in the regional context and to boost the ecological impact. Moreover, we are verifying the economic success of this approach by recording the development of biodiversity and farming income three times over 7 years.

Market incentives

The large Swiss organisation for integrated farming (IP-Suisse), combining one fourth of all Swiss farmers, incorporated the CPS in their production guidelines in 2009. All its producers have to reach a defined point score within a specified time period (15 points by 2013). As a consequence, most farmers have to (substantially) increase their ecological performance. The products of the IP-Suisse farmers are sold by the Swiss retailer Migros under the label "TerraSuisse". Additional to the federal compensation payments for ECAs, farmers benefit from bonus payments by the retailer.

Results

Evaluation of the credit point system

On the 133 farms, we recorded a total of 773 plant species, 33 grasshopper species, 69 butterfly species and 104 bird species. The credit points correlated with most of the biodiversity indicators. The point scores explained a substantial proportion of the variation in 12 out of 19 indicators. For detailed analyses of the biodiversity data we refer to a publication we are currently preparing (Birrer *et al*., in prep.). The point score models, however, were not able to explain much variation in occurrence of Red-List species. Overall, the point score thus seems to be an adequate and suitable tool to assess general biodiversity at the farm scale.

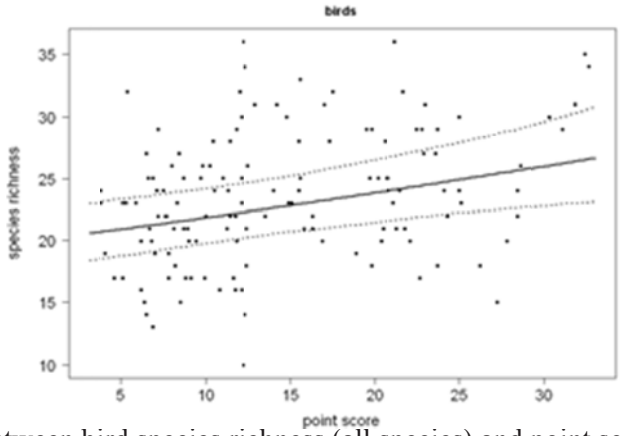

Fig. 1. Correlation between bird species richness (all species) and point scores. An increase from 10 to 20 points increases species richness by 2.0 bird species (9.1%). N = 133.

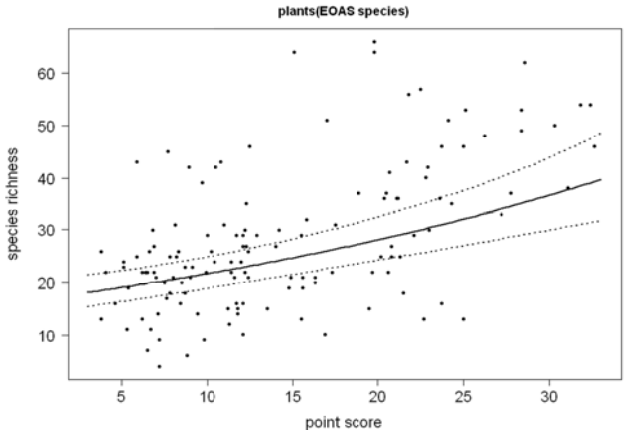

Fig. 2. Correlation between richness of plant species according to the Environmental Objectives for the Agriculture Sector (EOAS) and point scores. An increase from 10 to 20 points increases species richness by 6.5 plant species of the EOAS list (29.9%). N = 133.

Whole-farm advisory effect

Before the advisory support ECAs covered on average 8.9% of the agricultural area (Chevillat *et al*., 2012; Fig. 3). Extensively used meadows were the most frequent type of ECAs (60%), followed by tall fruit trees (20%) and hedges (8%). The advisors proposed increasing ECAs by 41% on average. Surprisingly, farmers implemented even more ECAs than originally suggested by the advisors. The percentage of ECAs finally rose to 152% of that before advice. The advisors specifically recommended implementing more arable options and converting extensively used but species-poor meadows into species-rich meadows. The option "floristically enhanced field margins" increased the most (8.8 times more), followed by "unimproved pastures" (5.9 times more) and "sown wildflower areas" (4.2 times more). On average, the mean percentage of ECAs increased from 8.9% to 13.5% (±1.1% SE) of the agricultural area (Fig. 4). The quality of ECAs (measured by defined criteria of the "quality scheme", Schweizerischer Bundesrat, 2001) increased by a factor of 2.6 and the area of ECAs meeting the criteria for the "connectivity scheme" increased by a factor of 3. The annual amount of compensation payments per farm increased on average by 3,500 CHF to 7,988 CHF (Fig. 4). Over all, the implementation of additional ECAs, and especially the increase of high-quality ECAs, did neither have a substantial negative impact on productivity nor on farming income. On the contrary, the gains increased on average by CHF 3,491 per farm (Chevillat *et al*., 2012).

Effects of the market incentives

For the IP-Suisse farmers' organisation, it was a challenging goal to raise the awareness of their 20,000 producers for biodiversity. To achieve this goal, farmers needed time and advisory support

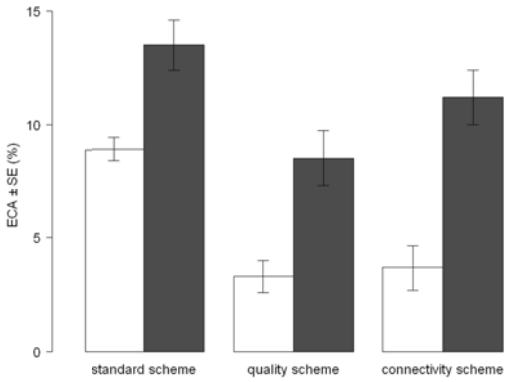

Fig. 3. Mean percentage (± SE) of ecological compensation areas (ECAs) before (white columns) and after advisory support (black columns) on 24 farms. Shown are the total percentage of ECAs per agricultural area, the percentage of ECAs which meet the criteria for the "quality scheme" and the percentage of the ECAs corresponding to the "connectivity scheme". Due to administrative reasons, only 15 farms were able to participate in the "connectivity scheme".

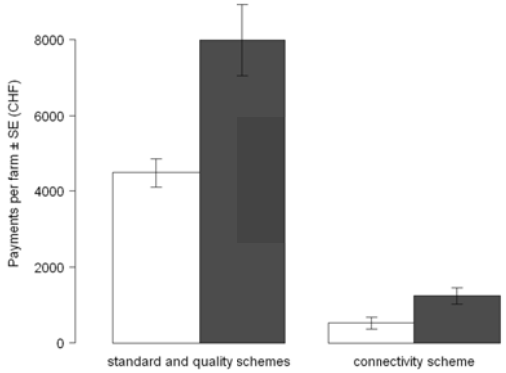

Fig. 4. Mean annual amount of compensation payments per farm (±SE) in CHF for ECAs within the "standard and quality schemes" and the "connectivity scheme", before (white columns) and after advisory support (black columns).

to make the necessary adjustments. Therefore, a progressive implementation of the new guidelines (over several years) was intended. By 2011, a minimum score of 12 CPS points was required. The target score of 15 points has to be reached by 2015. In 2010, IP-Suisse supported the farmers' implementation costs for new ECAs (seeds, plant material). This resulted in a significant increase in ECAs on the IP-farms; 11,288 tall fruit trees and 7,507 km hedges have been planted and 260 ha of species-rich meadows and 200 ha of wildflower areas have been implemented.

Most of the farmers producing under the IP-Suisse label are willing to fulfil the target score by 2013. In 2010, 40.5% of all farms reached more than 15 points (Fig. 5). 33.1% reached the temporary target of 12 points, whereas 26.4% scored less than 10 points. About 400 farms had to leave the label programme in 2012. It is expected that a third of the remaining farms will not reach the target score by 2013. This shows that the IP-Suisse guidelines for biodiversity are indeed a major challenge for many farms. However, this project shows that the advisors were able to motivate farmers, and that the latter were, after considering ecological and economic aspects, subsequently willing to contribute to promoting biodiversity on their land.

With the TerraSuisse label, the largest Swiss retailer, Migros, shows that wildlife-friendly produced food is widely accepted by many consumers. For wheat and meat in particular, the sustainable label products make up a large proportion of the total product range. Compared with the previous year, sales of TerraSuisse products rose by 7.4% to CHF 644 million in 2011, which is about 7% of the retailer's total revenue for foodstuffs. To maintain biodiversity and to raise the consumers' awareness about biodiversity, IP-Suisse and Migros are running an extensive marketing campaign.

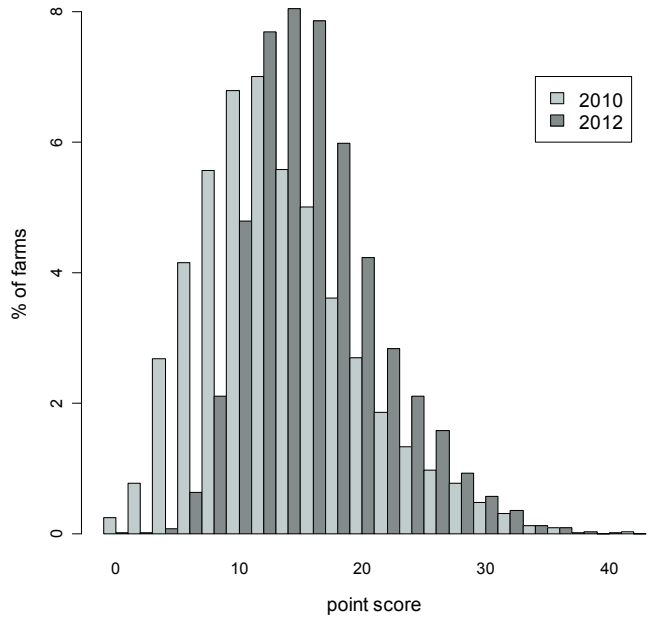

Fig. 5. Distribution of point scores of IP-Suisse farms in 2010 (n = 5860) and 2012 (n = 9531). The median increased from 13.4 to 16.5 points.

Discussion

Credit point system

Improving biodiversity on farmland depends on institutional and individual factors. Most importantly, agri-environment schemes provide effective conservation measures which incentivise farmers to move towards more sustainable practices. At the same time, farmers have to understand the complex interactions between producing food and using natural resources. They have to be motivated for a wise use of the environment. Farmers need simple, practice-oriented tools to implement the right options at the right sites and to measure their ecological as well as their individual performance. Our Credit Point System fills the gap between the demands of legislators and the needs of farmers. It is an easy-to-apply tool to assess the current status of biodiversity at the farm scale and helps farmers to increase biodiversity. The point score of the CPS is an adequate proxy for the biodiversity status at the farm scale.

Whole-farm advisory approach

This project clearly shows that a face-to-face advisory support is a key factor in improving biodiversity at the farm scale. The whole-farm advisory approach applied here, including economic and ecological analysis, significantly increased the farmers' willingness to take measures for biodiversity. Sixteen out of the 24 farmers implemented even more ECAs than the advisors had originally suggested. The quantity as well as the quality of the ECAs increased significantly and substantially exceeded our expectations. Even though Switzerland has well established agri-environment schemes with reasonable incentive payments, most farmers tend to implement not more than the minimum of 7% ECAs required to qualify for any federal payments. Many Swiss farmers are not aware that these biodiversity payments, especially the ones for high-quality ECAs, could substantially increase their income. Our results strongly support the hypothesis that sustainable and wildlife-friendly farming can create a "win/win situation" between economic and ecological aspects even on intensively used farmland in the Swiss Lowland Plateau.

Market incentives

The market incentive of two major stakeholders of the agriculture and agro-industrial sectors has sensitised farmers for ecological concerns and has encouraged the government's aim to reform

the Swiss agricultural policy towards more ecologically effective policies. It also had a positive impact on other farmers' organisations such as the Swiss organic farmers' association "Bio Suisse". Organic farming too had been criticised for neglecting aspects of biodiversity. Therefore, the very high potential for biodiversity conservation on organic farms should be fully exploited by setting sufficient incentives. The initiative of IP-Suisse put pressure on their organic farming colleagues to follow suit with objectives and measurable guidelines for biodiversity. Bio Suisse has developed its own action plan with a catalogue of options similar to the CPS. Up until 2015 all organic farmers have to implement a certain number of biodiversity options on their farms. About a third of all farms in Switzerland are affiliated to IP-Suisse and Bio Suisse, respectively. Both associations promote effective reforms of Swiss agricultural policies. There is optimism that Swiss agricultural policies and Swiss farming will accommodate more wildlife and environmental responsibility.

Acknowledgements

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