Enhancing biodiversity on arable farms in the context of environmental certification schemes

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SUMMARY

On agricultural farms and in farming districts throughout Europe, biodiversity has been in decline since the middle of the last century, the result of ever-increasing intensification and industrialisation of agriculture. To reverse this decline in biodiversity and the quality of agricultural landscapes, the EU and several actors in the agro-production chain have introduced regulations and initiatives to reduce farm management intensities and improve environmental quality on and around farms.

However, in these regulations and initiatives no specific attention has been paid as yet to on-farm biodiversity on conventional and high-intensive farms. Introduction of a certification scheme for the farm as a whole rather than for individual products would create scope for improving on-farm biodiversity as well as the quality of the wider landscape. Therefore, there is a need to explore a more general approach to include criteria for improving on-farm biodiversity in environmental certification schemes for conventional arable farming. With this in mind, a methodology for assessing the effects of current arable farming practices and management regimes of semi-natural habitats on on-farm biodiversity was developed, as well as criteria for enhancing on-farm biodiversity and landscape quality for inclusion in an environmental certification scheme for arable farming. To give an achievable research objective, this research has been focused on arable farming only.

An analysis of current Dutch certification schemes for both conventional and organic farming, showed that most of these labels focus primarily on only two aspects of farming: pesticide use and nutrient use. Also, the certification criteria employed are most often specified with reference to individual crops (except for organic farming). In most cases the criteria are merely qualitative, with quantitative thresholds an exception.

The first indicator developed for biodiversity was based on the total area of semi-natural habitat per farm, i.e. those areas with no intentional inputs of pesticides or nutrients and remaining undisturbed (e.g. aquatic, herbaceous and woody habitats). The practical implementation of this indicator on Dutch arable farms showed that on average the area of semi-natural habitat per farm was overall quite low (2.1 ± 1.6). However, it was remarkable that farms in the traditional small-scaled landscapes, e.g. the sandy regions in Drenthe and Noord-Brabant, had a smaller amount of semi-natural habitat per farm compared with farms in modern landscapes such as the Veenkoloniën, the Wieringermeer Polder and the Haarlemmermeer Polder. The highest average percentage of semi-natural habitat per farm was found in the Veenkoloniën, a very open reclaimed-peat landscape. Ditch banks were the most common kind of semi-natural habitat on farms, followed by ditches, hedgerows

and dry ditches. On farms participating in field margin projects, Agri-Environmental Schemes or farm nature conservation plans, the average percentage of semi-natural habitat was higher ranging from 5.3% up to even 7.3% in some cases. This area indicator has been shown to be methodologically sound, simple to measure and was capable of differentiating between regions, farm management regimes and the presence of Agri-Environmental Schemes. It was therefore concluded that this area indicator is appropriate for inclusion in an environmental certification scheme.

The enhancement of the area of semi-natural habitat on farms is in principle a good starting point for improving biodiversity on farms. However, the area of semi-natural habitat gives no direct information about the ecological quality, such as species richness of habitats or the shelter site availability for birds and small mammals. To improve the relevance of the area indicator for on-farm biodiversity, in a second step the management of semi-natural habitats was taken into account for both plant and animal species.

To be able to propose effective additional requirements for the management of semi-natural habitats aiming at an increase of on-farm biodiversity, next to the area indicator, differences in plant species richness were investigated in relation to management regimes, farming practices and regional or environmental variation. Therefore, the total plant species richness per semi-natural habitat was used as a response variable. This parameter appeared to be able to determine differences in species richness related to regional variation and farming practices. The plant species richness of ditch banks on conventional farms was significantly higher on sandy soils than on clay soils. Ditch banks on organic farms had a significantly higher number of plant species than those on conventional farms. On farms that had converted to organic farming more than 5 years ago, even more plant species were found, although this trend was not significant.

However, using the plant species as a response variable, no conclusive differences could be established between ditch banks on organic farms and ditch banks under an active ecological management and, therefore, the plant species composition and the nutrient requirements were also taken into account. The combination of the increase in plant species richness and the change in plant species composition (based on the rarity index and the Ellenberg nitrogen values), which was most marked in ecologically managed ditch banks on the experimental farms, indicated that ecological ditch bank management might enhance plant species richness more than organic farming alone.

For animal species additional habitat requirements were also proposed. These were focused on the availability of shelter sites for birds and small mammals on farms and were based on the vegetation height and cover of semi-natural habitats and crops in winter and summer. The habitat requirements of the following farmland species were investigated: skylark (*Alauda arvensis*), partridge (*Perdix perdix*), harvest mouse (*Micromys minutus*) and hare (*Lepus europaeus*) for wintering or nesting. Differences between three farm types were investigated and potential causes of any differences discussed in relation to farm layout, semi-natural habitat management regime and implementation of agri-environmental schemes. Three types of farm were selected for study: *conventional farms* with an intensive ditch bank mowing regime; *conventional-plus farms* with field margins implemented under the Dutch Agri-Environmental Scheme and an extensive ditch bank mowing regime, and

organic-plus farms with field margin strips implemented jointly under an Agri-Environmental Scheme or an on-farm conservation plan and again with an extensive ditch bank mowing regime.

In summer the *organic-plus farms* had less suitable habitat for skylarks and harvest mice than the two types of conventional farms, because of differences in crop rotation and ditch bank management. For the partridge, the *organic-plus* and *conventional-plus farms* performed better in winter than the normal conventional farms, owing to the presence of field margins. None of the farms provided any suitable winter habitat for hares. This method proved to be able to establish differences in shelter site availability associated with management regimes, farming practices and the implementation of Agri-Environmental Schemes or on-farm nature conservation schemes. Significant differences in shelter site availability appeared to exist between farms, but these were not clearly related to the different types of farms. Although the effectiveness of this method could not be validated, it was suggested that there is quite some potential for improvement and it can be used to propose habitat requirements for inclusion in an environmental certification scheme.

A combination of the area indicator together with the above mentioned management requirements aiming at both flora and fauna is a challenging approach to improve biodiversity within an environmental certification scheme for arable farms.

Farmers were interviewed to assess their motives on two issues: participation or non-participation in an environmental certification scheme for sustainable agriculture, and inclusion in such a scheme of various aspects of farming as well as specific criteria for enhancing on-farm biodiversity. The two main reasons cited by farmers for participating in a certification scheme were 'to improve the image of farming' and 'requests by retailers/supermarkets'. Therefore, the agro-production chain can play a key role in implementing an environmental certification scheme for sustainable farming on conventionally managed farms.

Most farmers were open to the idea of a certification scheme that includes criteria for pesticide use and nutrient use. These were regarded more important than criteria related to biodiversity. For creating new or extending the area of existing habitats on the farm, most farmers expressed a preference for field margin strips over hedgerows or other types of semi-natural habitat, these being less permanent and easily created and removed. More information or guidance is necessary to make farmers aware of the importance of maintaining and improving on-farm biodiversity and the quality of the agricultural landscape.

Application of the indicators developed determined differences in farming practices, crop rotations, ditch bank management regimes and farm layouts. Based on these results, the following habitat management criteria can be proposed for inclusion in an environmental certification system for arable farming:

- *habitat acreage*: 5% of semi-natural habitat per farm;
- *plant species richness*:
    - buffer zones next to all adjacent semi-natural habitats depending on the method of application following current legislation;

    - ecological management (mowing and removal of the cut grass) on ditch banks buffered with field margin strips;
- *shelter site availability*:
    - creation of field margins;
    - varying ditch bank management (partially no mowing in spring and autumn to create nesting, shelter and wintering sites).

If habitat management is included in such a certification scheme, the indicators developed here can be used to monitor the resultant impacts on biodiversity as well as farmer compliance with the set criteria.