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A NEW CONSERVATION STRATEGY FOR ARABLE PLANT
VEGETATION IN GERMANY – THE PROJECT
"100 FIELDS FOR BIODIVERSITY"

ABSTRACT

It is prudent to conserve communities which are as species-rich as possible. This is the only means of ensuring that species diversity but also gene diversity is high enough to allow for the necessary adaptations to changed environmental conditions. Arable plant communities are a special case here because losses in the last 5 decades have been particularly severe. Numerous studies from Central Europe reported dramatic declines of the segetal flora.

In most of the federal states of Germany, successful measures for protecting the segetal flora, such as the establishment of field flora reserves and field margin strip programmes have often unfortunately come to a halt due to changes in funding, lack of regional support or high levels of bureaucracy. The new project "100 fields for biodiversity", which has been funded by the Deutsche Bundesstiftung Umwelt (DBU) since 2007, aims to establish a network of protected areas for the preservation of endangered segetal species in Germany. Management aimed at preserving and fostering arable wild plants is to be guaranteed in the long term on at least 100 particularly suitable arable sites.

The feasibility study, funded by the DBU during 2007-2008 undertook: 1) Identification of floristically valuable arable sites throughout Germany and their incorporation in a database; 2) Compilation of an overview of field flora reserves/conservation fields still in existence based on a countrywide search; 3) Discussions about funding instruments and the options for implementing protection measures at a regional level with governmental authorities of all the federal states of Germany (excluding Hamburg, Bremen and Berlin); 4) Analysis of several alternative strategies for long-term financing of arable plant conservation.

The project "100 fields for biodiversity - establishing a nationwide conservation field network for wild arable plants" - is a national endeavour to provide a network of conservation sites as a long-term response to the loss of arable wild plants which has advanced unabated for decades. As a first milestone in the implementation phase it is aimed at securing 30 sites during the first two years of the project. By the end of the entire funding period there should be a network of at least 100 conservation fields under long-term protection. This is a unique opportunity in the history of the protection of arable wild plants of creating an urgently needed conservation system with at least medium-term protection for native arable wild plants.

INTRODUCTION

Background and motivation for the project

Against the background of evolving climate change, it is prudent to conserve communities which are as species-rich as possible. This is the only means of ensuring that species diversity but also gene diversity is high enough to allow for the necessary adaptations to changed environmental conditions (Hampicke *et al.* 2005). There is scarcely any ecosystem which has so markedly been influenced by human activity as agricultural fields (Ellenberg and Leuschner, 2010). Since the beginning of agriculture in Central Europe, the vegetation accompanying cultivated plants has changed repeatedly (Burrichter *et al.* 1993). In recent decades, increasing economic pressure on agriculture and the resulting refinement of weed control measures has led to unprecedented losses of species in agriculture landscapes. In recent years, concern has been growing that losses in both flora and fauna will effect ecosystem functioning and services (Jordan and Vatovec 2004, Tschardtke *et al.* 2005). One example comes from pollinators, which have been shown to decline in parallel with losses of flowering plants (Biesmeijer *et al.* 2006). Such studies demonstrate that losses of biodiversity at the landscape but also at the site level will affect even economically relevant ecosystem services.

Arable plant communities are a special case here because losses in the last 5 decades have been particularly severe. Numerous studies from Central Europe reported dramatic declines of the segetal flora, e.g. from the Stolzenauer Wesermarsch (Meisel 1966), Northern Hesse (Hotze and van Elsen 2006), Saxony-Anhalt (Hilbig 1985), Austria (Ries 1992), Lower Lusatia (Kläge 1999), Slovenia (Šilc and Čarni 2005) and the Czech Republic (Lososová and Simonová 2008). Both diversity and population sizes of arable plants have declined more strongly than in most other Central European managed habitats (Ellenberg and Leuschner, 2010). In many regions the collapse of segetal plants even exceeds the pronounced losses which were described for grasslands on mesic and wet soils (Wesche *et al.* 2009). Around 120 of the approximately 350 arable plant taxa in Germany are considered endangered, and 15-18 species are considered extinct in Germany (Hofmeister and Garve 2006). Around 70% of the endangered species are arable plants in the narrower sense, having their current centre of distribution in fields, vineyards or gardens. The larger parts of these are cereal companions.

Arable plant communities are secondary in the sense that they depend on agricultural land use; nonetheless in Germany 1/3 of the segetal flora is indigenous. The other two thirds are archaeophytes or neophytes mostly from the Mediterranean or Irano-Turanian region (Burrichter *et al.* 1993, Hofmeister and Garve

2006). Germany has a high level of responsibility for the protection of some of its arable weeds (Czybulka *et al.* 2009, Welk 2002): Lamb succory (*Arnoseris minima* (L.) SCHWEIGG. and KÖRTE) and Broadsepal speedwell (*Veronica opaca* FR.) have their distribution centre in Central Europe, while others like the anecophytes Whiskered brome (*Bromus grossus* DESF. ex. DC.) even evolved here with the development of crop cultivation (Scholz 1996, Sukopp and Scholz 1997).

The indigenous arable plants in Central Europe are often poor competitors under stable conditions and depend on regular disturbances, which naturally occur in habitats such as riverbanks, active sand dunes and mammal burrows (Krause 1956). These natural habitats have become rare in the agricultural landscapes of Central Europe, giving the secondary habitats a high importance for species survival. Therefore, many of the threatened arable plants can only be conserved if appropriately managed fields are provided. Sites need to be regularly ploughed and kept in an early successional stage, and have thus to be cultivated but without heavy application of fertilizer and pesticides (Geiger *et al.* 2010).

Moreover, even a number of more widespread segetal species are currently declining all over Europe because of the impacts of modern arable farming in agricultural ecosystems (Stoate *et al.* 2001). This casts doubt on the idea that some of the Central European species will survive e.g. in the Mediterranean region (Nezadal 1994, Turland *et al.* 2004, Bergmeier 2006). Finally, next to nothing is known about genetic structuring in European segetal populations so arable plants from a wide range of sites should be conserved. Taken together, both general and specific considerations imply that segetal plants should receive more attention from both conservationists and policy makers.

The project "100 fields for biodiversity"

In most of the federal states of Germany, successful measures for protecting the segetal flora, such as the establishment of field flora reserves and field margin strip programmes have often unfortunately come to a halt due to changes in funding, lack of regional support or high levels of bureaucracy (Meyer *et al.* 2010). The new project "100 fields for biodiversity", which has been funded by the Deutsche Bundesstiftung Umwelt (DBU) since 2007, aims to establish a network of protected areas for the preservation of endangered segetal species in Germany. Management aimed at preserving and fostering arable wild plants is to be guaranteed in the long term on at least 100 particularly suitable arable sites.

MATERIALS AND METHODS

The project "100 fields for biodiversity" is based on a feasibility study for the establishment of "Conservation fields for arable wild plants in Central Germany" (Meyer and van Elsen 2007). The feasibility study, funded by the DBU during 2007-2008 undertook:

- 1) Identification of floristically valuable arable sites throughout Germany and their incorporation in a database;
- 2) Compilation of an overview of field flora reserves/conservation fields still in existence based on a countrywide search;
- 3) Discussions about funding instruments and the options for implementing protection measures at a regional level with governmental authorities of all the federal states of Germany (excluding Hamburg, Bremen and Berlin).
- 4) Analysis of several alternative strategies for long-term financing of arable plant conservation.

RESULTS

Feasibility study (2007/2008)

The project's five regional coordinators ensure that the relevant actors and contacts throughout the country as well as potentially suitable sites in all important agricultural and major geographical areas of Germany are included in the conservation measures. During talks with the relevant governmental institutions departments of the respective German federal states, various financing options for conservation fields were considered and optimisation strategies discussed. The financing options are aimed specifically at the German federal states and regions. This means that their implementation requires a high degree of discussion and support for the actors on site (e.g. representatives of the administrative districts, landscape conservation associations).

Identifying floristically valuable sites for segetal flora

As part of the countrywide search for suitable conservation areas, surveys were carried out during the growing season to record species lists, site conditions and management methods in order to assess the value of the areas. Information is currently available on over 600 potential sites which merit conservation, and contacts have been established with all the relevant stakeholders and institutions in the realm of "arable wild plant conservation".

Status quo of arable wild plant conservation in Germany

At the start of the project the existing conservation schemes for the segetal flora in Germany were evaluated by means of a questionnaire survey (Meyer *et al.* 2008). Remarkably, half of those questioned had not had any exchange of views with those involved in other conservation initiatives up to that point, although 95% of respondents expressed an interest in an exchange of this kind. The respondents hoped that a national network would provide better public relations, improvement in the status of arable wild plant protection and contacts and stimulation for practical nature conservation. The existing successful initiatives would benefit from a regional coordination structure as well as advice on management in order to optimise areas for arable wild plant conservation. Summarising the pros and cons, those questioned judged that the few existing initiatives for conserving arable wild plants are positive in terms of species protection but are not economically viable (Meyer *et al.* 2008).

Options for long-term financing of conservation fields

Talks were held with the government departments of all the German federal states (excluding Hamburg, Bremen and Berlin) on funding instruments and the options for implementing the field conservation project at federal state level. The funding options considered were those from the EU, the Federal Government and the German federal states. The outcome of these investigations revealed several alternative strategies for long-term financing of conservation fields. For land purchase and management, a mixture of instruments from agri-environmental schemes, funds from the intervention/compensation provisions (see Czybulka *et al.* 2009) and specific instruments from the German federal states appears to be adequate for safeguarding the fields and ensuring appropriate management methods in the long-term.

Results of the feasibility study show that, despite severe depletion, there were (still) numerous stands of arable wild plants with the potential of development and in urgent need of safeguarding.

Implementation phase (starting in 2009)

Suitable protection and management instruments are available and should be further developed in order to establish a network of conservation fields in Germany. In the implementation phase, solutions should be individually tailored with regard to

- purchase (or long-term lease) of the areas,
- guaranteed management aimed at protection of the arable wild plants (by lo-

cal farmers, societies etc.),

- financing of the safeguarding of the areas and long-term management to encourage arable wild plants.

Only a long-term financial commitment will ensure the support of farmers. This is one of the main causes of the failure of most former field margin strip schemes, which depend on regular renewal of the temporary agri-environmental programmes. In addition, networking and the exchange of ideas are of crucial importance, because even under non-intensive farming, inappropriate management can lead to losses of the special species assemblages.

In our project the designation "conservation field" applies to one whose species assemblage is outstanding from a botanical point of view and where long-term protection is ensured by appropriate contractual agreements or legal safeguards. An area under the private ownership of nature conservation stakeholders is of equal value. Support from a contact person on site (such as nature conservation association) is required. The first conservation field areas were established in the summer of 2009. Additional information is available at: www.schutzaecker.de



Fig. 1. Conservation field at "Kahlen Berg/Weissenburg" near Wundersleben (Thuringia) in May 2007 with Sickie spurge (*Euphorbia falcata* L.), a species very rare in Germany

Case study of a conservation field under long-term protection

The approx. 5.5 ha Keuper field which was funded in the 1990s through the Thuringian KULAP Programme (Programme for Culture and Landscape Protection) was bought in 2007 following an initiative of the "100 fields for biodiversity" project and the Sömmerda lower nature conservation authority through budget resources from the administrative district. The site's outstanding characteristic is the presence of the very rare Mediterranean Sickle spurge (*Euphorbia falcata* L. – Fig. 2) which reaches the most north-westerly limit of its distribution here. Thuringia has a national responsibility for the preservation of this species. The Sickle spurge is an example of a so-called stubble flowerer, and is dependent on late stubble cultivation. A suitable management plan for that species was therefore developed with the district's lower nature conservation authority and the land manager. This includes leaving the stubble unturned undisturbed until September to ensure reproduction of the annual Sickle spurge. Besides this floristic highlight, the field also supports additional noteworthy segetal plants from the Caucalido-Scandicetum such as Pheasant's Eye (*Adonis aestivalis* L.), Roughfruit corn bedstraw (*Galium tricornutum* DANDY), Hare's-ear mustard (*Conringia orientalis* L. (DUMORT.)) and Carrot bur parsley (*Caucalis platycarpos* L.).



Fig. 2. Sickle spurge (*Euphorbia falcata* L.), a species very rare in Germany ("Kahlen Berg/Weissenburg" near Wundersleben (Thuringia) in May 2007)

A financial guarantee for the management has been secured through funds from the administrative district in an initial stage lasting 10 years. It was agreed that this area of national floristic importance should receive permanent support from the regular budget of the administrative district. Thanks to the joint efforts of a wide variety of supporter campaigners, all the required criteria (high floristic value of the area; area safeguarded by purchase; and long-term financial guarantee for extensive management) were able to be fulfilled. This means that the field can be listed nationally as one of the "100 fields for biodiversity".

DISCUSSION AND OUTLOOK

In order to ensure that field ecosystems are able to function even under possibly changing climate and land use conditions, a minimum of taxonomic and genetic variability in the companion flora and fauna is essential. A network of conservation fields which function as a species source and gene reserve in the agricultural landscape can make an important contribution to this. Because practically all segetal species are ephemeral and can therefore be subject to rapid genetic drift, the protected populations should contain relatively large numbers of individuals. In view of the rather slow rates of dispersal of the species, attention should be given to having as good a network of sub-populations as possible. The establishment of regional "source areas" can form an initial important stage in the preservation of a region's typical segetal flora.

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