Evaluation of the agronomical and environmental relevance of the CAP measure 'flowering grassland'

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Abstract

We aimed to evaluate an agri-environment measure called 'flowering grassland', devoted to biodiversity preservation in French grasslands. This measure is controlled by a short list of easily identifiable plants (indicators). Flora, agronomical and ecological value of a set of 671 grasslands of four French natural regional parks were studied. The indicators used for the control are mainly linked to the total species richness of the grasslands. Other aspects of the grassland value are less related to these indicators, including ecosystem services like preservation of patrimonial species or contribution to pollinator activity. Agronomical value of grasslands seems poorly linked to the short lists of plants. Finally, the methods used to construct plant lists were analysed. A wide range of lists was found among natural regional parks and it appears as a crucial step for the final result, the preservation of biodiversity.

Keywords: permanent grassland, biodiversity, agri-environment measure

Introduction

Permanent grasslands are ecosystems with a potentially high vegetal and animal diversity. As these grasslands occupy almost 40% of the land used in the European Union, their management may be a powerful lever for the EU's internal policy on biodiversity protection. Agri-environment measures designed for biodiversity conservation in grassland have, historically, forced farmers to adapt their management, for instance by reducing fertilization or delaying harvest date. Since 2000, the MEKA programme in Baden-Wurttemberg (Germany) has introduced an agri-environment measure for grassland, to promote 'species rich grasslands'. This is a new type of measure because farmers receive public subsidies only if they reach atarget plant richness, but they are free to choose their practices. In MEKA programme, the result is controlled by the observation of four species, within a list of 28 species elaborated on phytosociological rules (Oppermann and Gujer, 2003). Similar measures were applied in other countries such as Switzerland. In France, this measure was more recently introduced by the Ministry of Agriculture, after a proposal coming from the federation of the natural regional parks (NRP). The measure is comparable to the German one, and is currently applied in some NRP, mainly in Natura 2000 areas. Our work is to assess the relevance of the measure in a mixed agronomical and environmental point of view. The first objective was to verify the relation between plant species richness observed in the grassland and the number of species used to control the measure. Moreover, we aimed to evaluate the impact of this measure on other biodiversity parameters, and on the agronomical value of the grassland.

Materials and methods

The evaluation of the method was conducted in France in four natural regional parks (NRP), three of them in mountainous areas (Bauges, Haut-Jura and Ballons des Vosges) and a lowland NRP in the centre of the country (Brenne). The initial dataset was made up of 671 relevés of permanent grasslands, performed with a phytosociological methodology. As lists of

species retained for the control of the agri-environment measure (so called 'control species') were known for each NRP and habitat, it was possible to determine the number of 'control species' in each of the 671 relevés. This dataset was used to link the number of 'control species' with the following criteria of diversity: total plant species richness (R) and total plant oligotrophic species richness (RO), oligotrophy being evaluated with the Ellenberg nitrogen fertility index. For the other following criteria, the number of available data was lower (17 to 183): Rarity index was based on the mean value of a rarity coefficient of present species (Pervanchon et al., 2005). Experts (group of scientists, farmers, advisers) evaluated the value of the vegetation for pollinators (pollinator index), and how long forage value was high enough for cattle requirement (qualitative appreciation so called 'agronomical adaptability', adapted from Meister et al. (1988)). Pastoral value was calculated as established by Daget et al. (1972), and forage dry matter yield was measured (hay biomass) or estimated in case of grazing (livestock unit x 13.5 kg day^{-1}).

Results and discussion

Main results are presented in Figure 1, where a selection of criteria is plotted against the number of 'control species'.
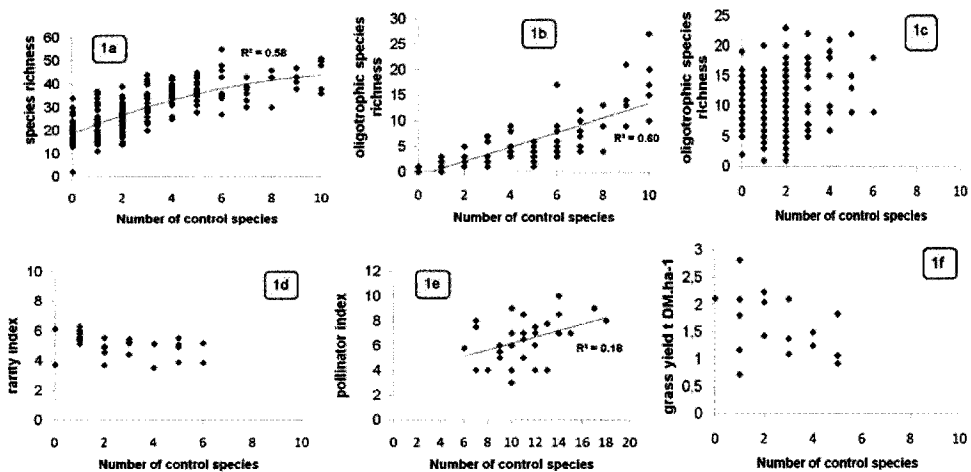

Figure 1 : Relation between the number of 'control species' and the total species richness (1a), oligotrophic species richness in Natural Regional Park of Haut-Jura (1b) and Ballons des Vosges (1c), rarity index (1d), pollinator index (1e) and mean grass annual yield estimated during 3 years (1f). Number of points depends on available data in Natural Regional Parks, and graphs associate data from several parks.

The number of control species (NCS) significantly increases with the total species richness (Fig. 1a), as previously demonstrated by Wittig et al. (2006) in a similar experiment in North-western Germany. A reduction of the slope for higher values of NCS was noticed. For a given NCS value, the variability of the species richness is relatively high (± 20 species). Unlike the total species richness, the relation between NCS and the total number of oligotrophic species depends on the situations. In the NRP of Haut-Jura (Fig. 1b), a close and positive correlation appears between these two variables, although no relation can be highlighted in the NRP of Ballons des Vosges (Fig. 1c). Poor links were found between NCS and the two remaining diversity criteria: rarity index (Fig. 1d) and pollinator index (Fig. 1e). The relation between agronomical performances of grasslands and NCS was not significant, either for grass annual

yield (Fig. 1f) or other criteria not shown in this paper: pastoral value and agronomical adaptability. These yields obtained for unfertile grasslands (altitude >900 m) have to be confirmed for more productive ones. The close relation between species richness and the number of 'control species' (NCS) is logical, as the list of 'control species' was above set in order to evaluate this aspect of biodiversity. However, the variation in species richness for a given value of NCS, tested on 671 grasslands, demonstrated a poor precision. A possible explanation can be found in the design of the 'control species' list. Indeed, only one list of plants is used for several natural habitats, in order to simplify the control procedure in a region. Species richness is the most common diversity criteria in research works, but its ecological or agronomical significance is widely discussed. The number of oligotrophic species appears as interesting criteria in an ecological point of view. The opposite links observed in Fig. 1b and 1c were related to the methodology to build lists which differs between NRP (i.e. taking in account or not agronomical aspects by choosing forage productive species). Finally, the poor relationships between agronomic criteria and NCS must be carefully interpreted, due to the low number of data points, and the grasslands concerned by Fig. 1e (highland situations with forage annual DM yields above 3 t ha^{-1}). Nevertheless, it is not surprising to observe this lack of link, as the list of 'control species' in many NRP, generally do not take into account forage production aspects. If confirmed by more data points, this fact could be positively interpreted, in the perspective of reaching a compromise between productivity and biodiversity.

Conclusion

The number of 'control species' logically mainly indicates the total plant species richness of permanent grasslands. Unfortunately, it poorly shows other aspects of biodiversity. The methodology to build a list locally (i.e. in a specific natural regional park) clearly affects the significance of the observation of 'control species' in a grassland. Studies are currently conducted at the French national level (22 NRP) to precise and confirm the results of the present study and methodologies will be tested during a national flowering grassland competition.

Aknowledgments

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