# Assessing the pollination value of field margin flora by means of a predictive indicator

Christian C. Bockstaller, Charles Ricou, Chloé Schneller, Sabrina S. Gaba, Bruno B. Chauvel, Bernard B. Amiaud, Sylvain Plantureux

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# ESA12

# Abstracts

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Bockstaller, Christian[1]; Ricou, Charles[1]; Schneller, Chloé[2]; Gaba, Sabrina[3]; Chauvel, Bruno[3]; Amiaud, Bernard[4]; Plantureux, Sylvain[5]

*[1]INRA, UMR 1121 Agronomie et Environnement BP 20507, 68021 Colmar, FRANCE; [2]INRA, UMR 1121 Agronomie et Environnement BP 20507, 68021 Colmar,, FRANCE; [3]INRA, UMR 1347 Agroécologie, BP 86510, 21065 Dijon, FRANCE; [4]Université de Lorraine, UMR 1121 Agronomie et Environnement BP 172, 54505 Vandoeuvre-lès-Nancy, FRANCE; [5]Université de Lorraine, UMR 1121 Agronomie et Environnement BP 172, 54500 Vandoeuvre-lès-Nancy, FRANCE*

## Introduction

The work of the Millennium Ecosystem Assessment (2005) has highlighted the role of biodiversity in providing ecosystem services such as pollination, essential to ensure the sustainability of agricultural systems. In agroecosystems, the innovative management of field margins is one of the means to maintain biodiversity. The development of a management system that sustains such a service requires operational assessment tools in the form of indicators. Predictive indicators derived from a model present an acceptable trade-off between the feasibility and integration of processes, as well as *ex ante* assessment (Bockstaller et al., 2011). Here, we present the structure of a new indicator that assesses the pollination value of field margin flora, plus the first validation results.

## Materials and methods

We used a functional approach to link floral traits to pollination. Based on a review of the literature, we selected three variables related to the *visual attractiveness* of flowers for the pollinator, *flower accessibility* for pollinator, and *reward* (quantity, and quality, of nectar and pollen). We based the indicator on a hierarchical decision tree to aggregate quantitative and qualitative variable sets in fuzzy subsets to avoid the knife-edge effect of classes. Each variable is assessed by specific traits through a decision tree. The indicator outputs are expressed on a scale ranging between 0 (low value) and 10 (high value). An evaluation of the predictive value of the indicator was run on a set of field margins from two locations: (1) fields with maize/wheat or maize/maize rotations from the

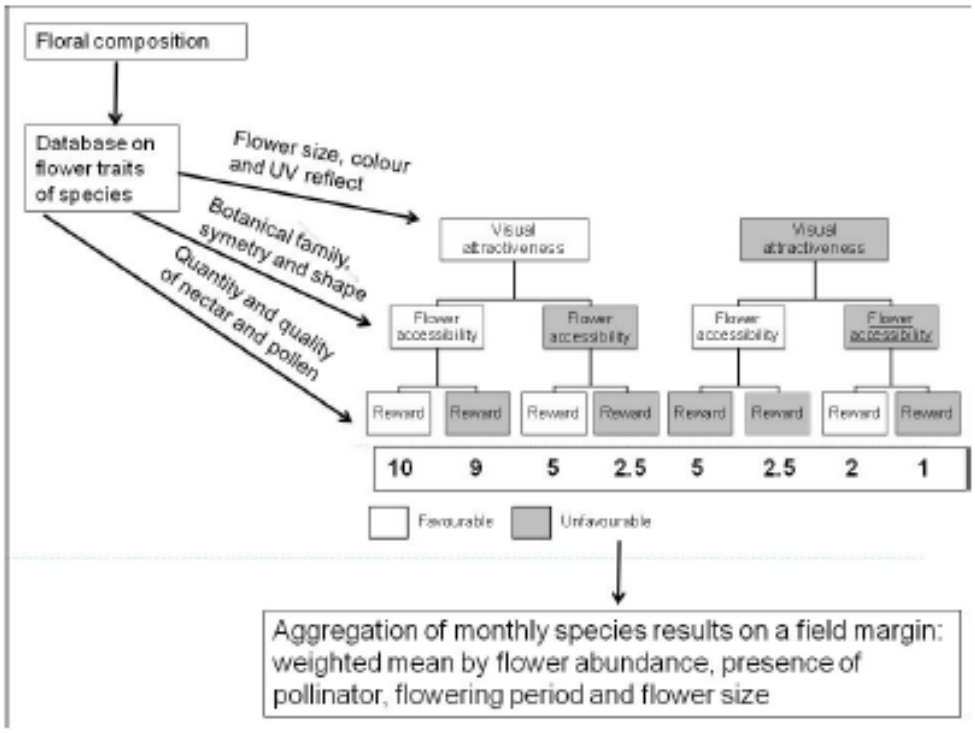


***Figure 1:** Overview of the pollination value indicator.*

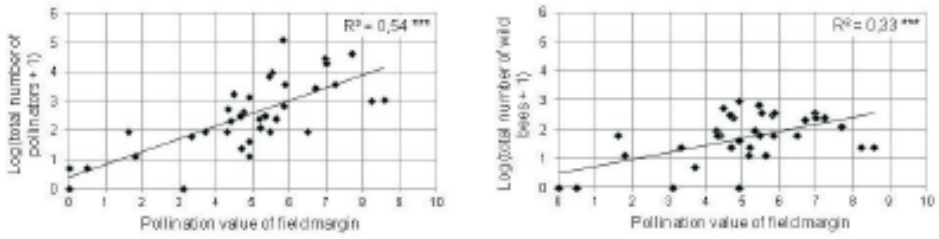


*Figure 2: Evaluation of the predictive value of the indicator for total pollinators (left) and wild bees (right).*

area of the INRA Experimental Station of Colmar (Alsace region), some of them with sown field margins; and (2) fields in the Fenay area close to Dijon (Burgundy region) with winter rapeseed/cereal rotations. We identified the floral composition of each field margin by means of a specific protocol (Roger, 2007) and floral abundance (number of flowers or inflorescences), as well as the abundance of four pollinator groups: honey bees, wild bees, bumblebees and hoverflies.

## Results

We built a database containing the information necessary to calculate the indicator for 338 species, the main weeds of arable fields, as well as endangered weeds and species contained in seed mixtures for sown field margins. Figure 1 shows an overview of the structure of the indicator. The calculation was adapted to the specificities of wild bees, bumblebees and hoverflies. The analysis of the field observations showed significant positive correlations between indicator values for total pollinators and for each pollinator group, i.e., wild bees, bumblebees and hoverflies, with the exception of honey bees (Fig. 2).

## Conclusions

The indicator presented here makes it possible to assess the pollination value on the basis of the floral composition of field margins in arable land. Those data are obtained by field observation but may also be predicted by a model (Ricou et al., 2011). The first results of validation are encouraging, except for honey bees. For this last group, landscape elements as well as the crop itself (e.g., rapeseed) may have a major attractive effect.

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