Which structure and composition of agricultural land-use mosaics to enhance multiple services provided by arable weeds?

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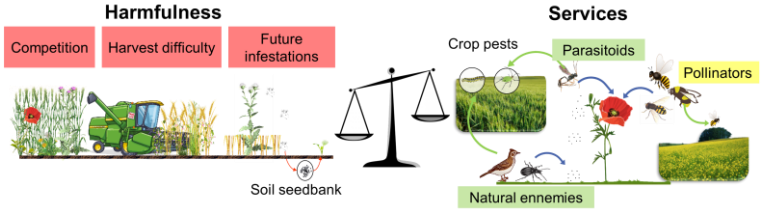
- Arable weeds = interesting component of agricultural landscapes as they can potentially be harmful to crop production but also support organisms delivering pollination and pest control services

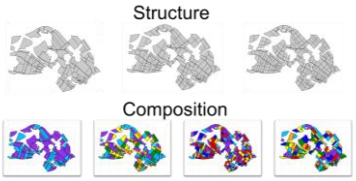


- Weed contribution to harmfulness and services was computed with 9 indicators that accounted for intraspecific variations in response to growing conditions, i.e. crop type and location within the field (*Yvoz et al., 2021 - EcolInd*)

➡ Here, we explore to what extent **changes in the structure and the composition of the land-use mosaics** could improve **the trade-offs between harmfulness and services provided by weeds**

Materials & Methods

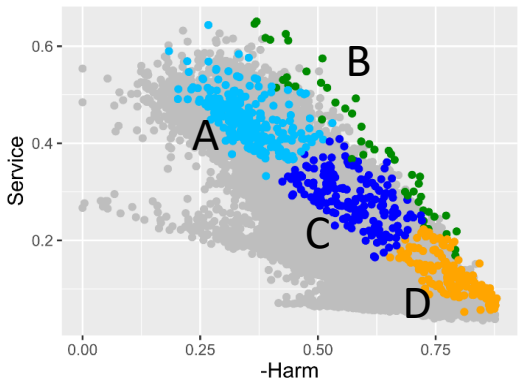
- Simulation of 72,000 land-use mosaics varying by the average field size (structure) and the proportion of 8 contrasted crop management strategies (varying by the crop sequence and the farming practices implemented)



- Random allocation of the 9 proxies depending on the crop type, the strategy and the within-field location and identification of the mosaics expressing the best compromise by a Pareto frontier analysis

Results

- **638** simulated mosaics were located on the **Pareto frontier** and classified into **4 groups** according to their contribution to services and harmfulness



Group	A	B	C	D
Number of mosaics on the Pareto frontier	249	48	181	160
Multifunctionality				
Services	0.45 d	0.40 c	0.29 b	0.13 a
-Harm	0.35 a	0.60 c	0.57 b	0.79 d
Stability	0.34 b	0.12 a	0.35 b	0.34 b
Structure				
% big fields	36.9	79.2	48.1	48.1
% medium fields	31.3	18.8	33.1	34.4
% small fields	31.7	2.1	18.8	17.5
Composition				
Number of strategies	1.47	3.25	3.9	4.5
% cover S1	91.7	6.4	37	6
% cover S2	0.1	2.7	3.4	5.8
% cover S3	0.9	7.1	6.2	24.1
% cover S4	5.4	58.4	11.6	7.3
% cover S5	1.1	1.5	25.9	10.9
% cover S6	0.4	19.7	10.3	39
% cover S7	0.3	2.5	3.2	4.4
% cover S8	0.1	1.7	2.4	2.5

- There are **antagonisms** between the weed contribution to services and to harmfulness and their stability
- Land-use mosaics composed of **many** contrasted crop management **strategies** expressed the best compromise (*i.e.* medium level of services and harmfulness and high stability). This highlights **complementarities** between **crop types** and **crop management strategies**
- Decreasing field size, i.e. increasing the area of field edges in the landscape, did not improve trade-offs.

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