Factors affecting species richness and composition of Italian arable plant communities across different agricultural landscapes

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Arable plants are of great conservation and ecological interest due to their support to biodiversity and provision of ecosystem services. In springs of 2018 and 2019, we surveyed arable plant communities in winter cereal and legume crops of mainland Italy using 149 plots of 1×16 m size (one per field, Fig. 1a), oriented along seed-drill lines and positioned in the inner part of the field. We collected sets of agronomic, spatial, environmental, and landscape variables to check their explanatory ability on patterns of species richness and composition of the surveyed communities. Land use was visually interpreted using recent satellite images in a GIS environment, by using a buffer circle of 400 m radius around the field centre. Landscape patches were classified according to seven land use categories.

We used Redundancy analyses (RDA) to assess the effect of the variables on the richness and composition of the surveyed communities. We assessed the significance of RDAs by means of anova tests. Variation partitioning was carried out to highlight the relative contribution of each set of variables to the overall variation in species richness and composition, removing non-significant variables. The analyses were performed in the package *vegan* of R-project.

The variables had a higher explanatory power on richness (46% of explained variation) than composition (27%). Some agronomic variables (crop species and amount of fertilizers per hectare, the latter used as a proxy of agricultural intensity) explained differences in species composition, but not in species richness. Some landscape variables (type of rural area, landscape complexity – measured through the Shannon index and the total number of patches – and abundance of different land use types) did not significantly affect community composition. On the contrary, species richness was positively related to the abundance of woody elements (shrublands, hedges, forests, isolated trees) in the landscape (Fig. 1b).

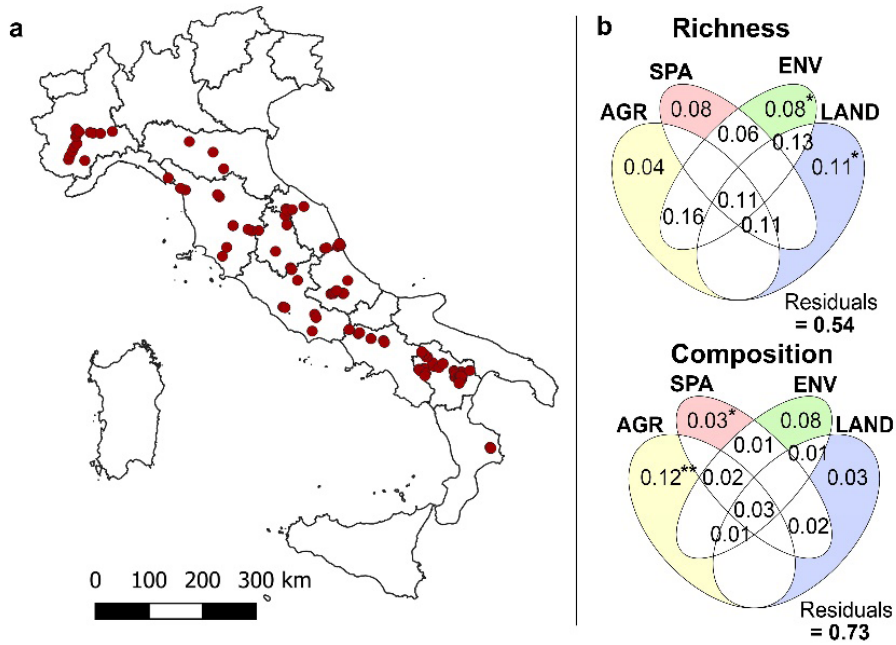

Fig. 1. a) Distribution of the plots in Italy; b) Venn diagrams showing the proportion of explained variation by the selected groups of variables on species richness and composition; * = P ≤ 0.05; ** = P ≤ 0.01