

## Effects of farming system on weed seed bank and on invasibility in arable fields: evidences from the long-term DOK trial

F. Xavier Sans Serra<sup>a</sup>, R. Rotchés-Ribalta<sup>a</sup>, J. Mayer<sup>b</sup> and P. Mäder<sup>c</sup>

<sup>a</sup> Biodiversity Research Institute (IRBio)/Department of Evolutionary Biology, Ecology and Environmental Sciences, University of Barcelona, Spain

<sup>b</sup> Agroscope Reckenholz-Tänikon Research Station ART, Switzerland

<sup>c</sup> Research Institute of Organic Agriculture (FiBL), Switzerland

Agricultural intensification over last decades has resulted in a great increase of crop yields, but it also had a detrimental impact on biodiversity. The dramatic decline of arable weed diversity is a matter of great concern because weeds have an important ecological function as a key component of the food web of agroecosystems. Weeds are suitable indicators of management effects on wildlife diversity in arable crops because they have high sensitivity to cultivation measures and have a strong relation to other organism groups. Nevertheless, the effect of farming management on weed abundance and diversity will be more reliable on weed seed bank rather than on aboveground weed community because it is the result of processes that have occurred in the past and consequently, it could better reflect the effect of the agricultural practices over the years.

While the negative effect of invader weeds on crop yields have been widely regarded in agroecosystems, few studies, to our knowledge, have devoted to the role of farming system, defined as a complex interaction of factors, on invasion process, although invasion by exotic and native weeds could also dramatically affect biodiversity as occurs in a wide range of ecosystems. The periodical soil disturbance, the large amount of external inputs such as fertilizers and pesticides are the main factors driving invasibility, defined as the inherent susceptibility of an environment to the colonisation and establishment of individuals from species not currently part of the resident community.

The aim of this presentation is to show main results of (1) a study aiming at evaluating the effect of farming systems on weed seed bank abundance and diversity and shifts in assembly of weed communities of the soil seed bank, and (2) another study aiming at analysing if invasibility could be affected by farming system. The first study was carried out in wheat and maize crops under organic and conventional farming practices within a replicated, long-term experiment [DOK biodynamic (D), bioorganic (O), Conventional (K) trial, Therwil, Switzerland], and the second only in the maize crop.

The long term management on arable fields has significant influence on the size and composition of the weed seed bank. Seed abundance and species richness were higher in the organic systems than in the conventional systems, and weed abundance of species were more evenly distributed in organic farming systems. Functional traits of soil seed bank vary among farming systems, so organic management determined the establishment of more annual and forbs species which reflects the less intensity- The study on invasibility was based on simulated invasion by *Amaranthus retroflexus* through seedling transplant introductions into farming systems. The growth of *A. retroflexus* was significantly higher in conventional systems; the higher mineral fertilisation and its fast release of nutrients lead a greater availability and a more efficient uptake of limiting resources (i.e. N and P). The pre-reproductive mortality was higher in conventional systems due to the higher abundance of slugs in those systems and, in turn, to lower abundance of insects eating slugs. The outcome of the balance between the negative effect of predation by slugs and the positive effect of resources availability on growth of *A. retroflexus* through the different systems reflects that invasibility is enhanced in conventional systems.