New arable field plots

Acknowledgments

We acknowledge the friendly permission to install these plots granted by the

responsible land owners, land users, and authorities, and the excellent work of all Local Management Teams in establishing them in 2024.

Rationale

In 2024, 10 plots were established on arable fields in each of the three Exploratories.

A first sampling to assess basic biodiversity and ecosystem functioning data was started from April onwards by several core projects (plants, arthropods, soils, microbes) and one contributing project (RecovFun).

The major aims of this activity are:

1. Extension of the land-use intensity gradient beyond forests and grassland to cropland, with significantly higher inputs of energy, to allow comparisons.
2. Covering a major land-use type to enhance analysis at landscape scale and to account for landscape effects.

Four more plots on arable land per region will be installed for every exploratory in 2025, resulting in a total of 42 plots across all three Exploratories, 14 per Exploratory.

In 2024 data on aboveground vegetation, the soil seed bank, arthropod diversity, soil parameters and soil microbes were sampled on 30 plots in total. In the following, first results will be presented in comparison with grasslands and/or forests in the exploratories.

Important note:

Research on arable plots in 2026–2029 must always complement research conducted in grasslands and forests. Projects with a pure focus on arable land are not encouraged.

Plants

Plant diversity per plot was lower than in forests and much lower than in grasslands. Among arable fields, plant diversity was 2 and 3 times higher in the Alb and Schorfheide, respectively, than in the Hainich. A similar pattern could be found for the soil seed bank. These results mainly reflect the high proportion of organic agriculture in the Schorfheide and the particularly high management intensity in the Hainich.

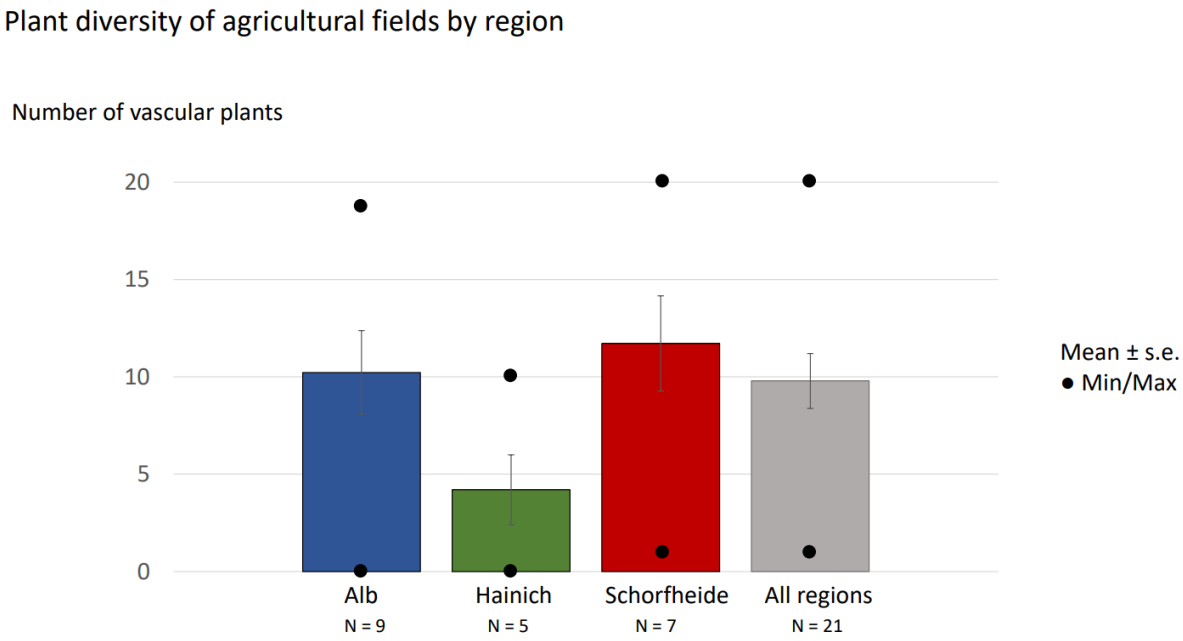

Fig. 1: Mean number of vascular plant species in arable field plots across the Exploratories.

Arthropods

Arthropod numbers were significantly lower in arable fields than in grasslands across all Exploratories. At the same time, arable fields differed significantly from grasslands in their species composition and added new species to landscape scale diversity.

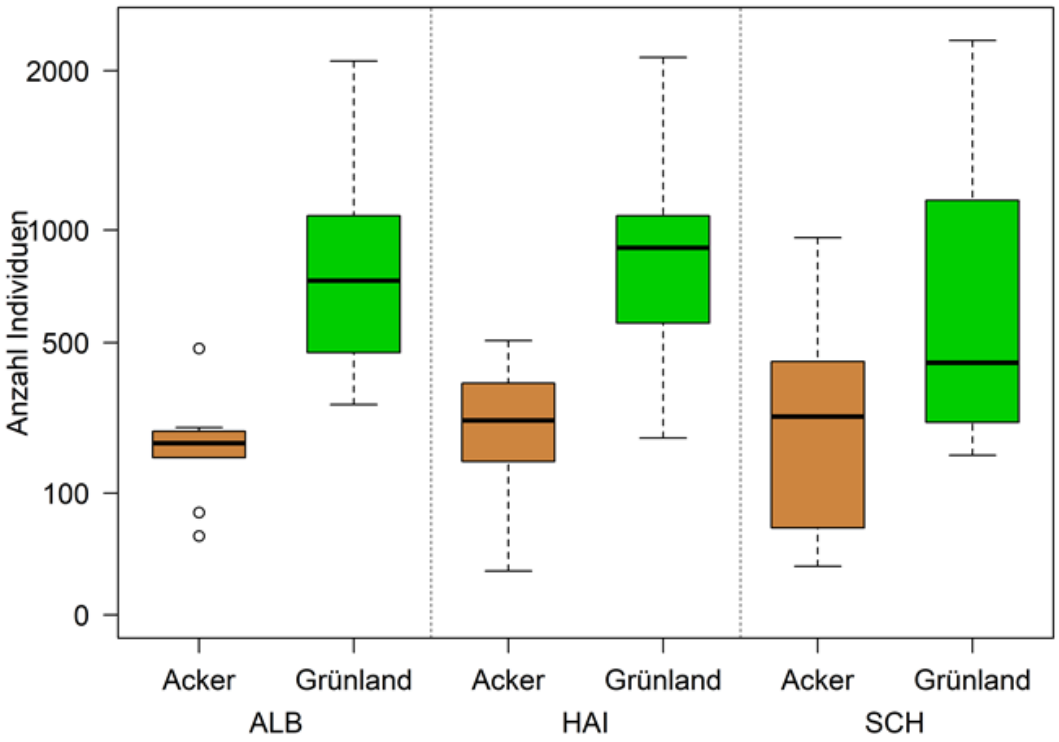

Fig. 2: Mean number of arthropod individuals in arable field plots and in comparison to grasslands across the exploratories.

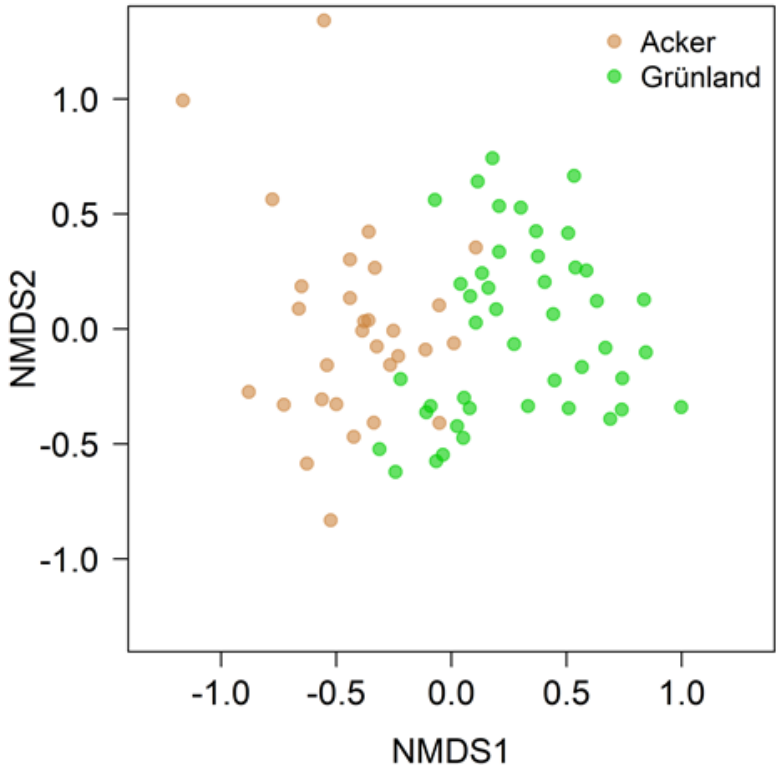

Fig. 3: Species composition of arthropods in arable field plots in comparison with grasslands across the exploratories.

Soil parameters

Across all exploratories, arable fields had significantly lower **soil organic carbon** stocks in the mineral topsoil compared with grasslands and forests, while topsoil **pH-values** were very similar to those of grasslands.

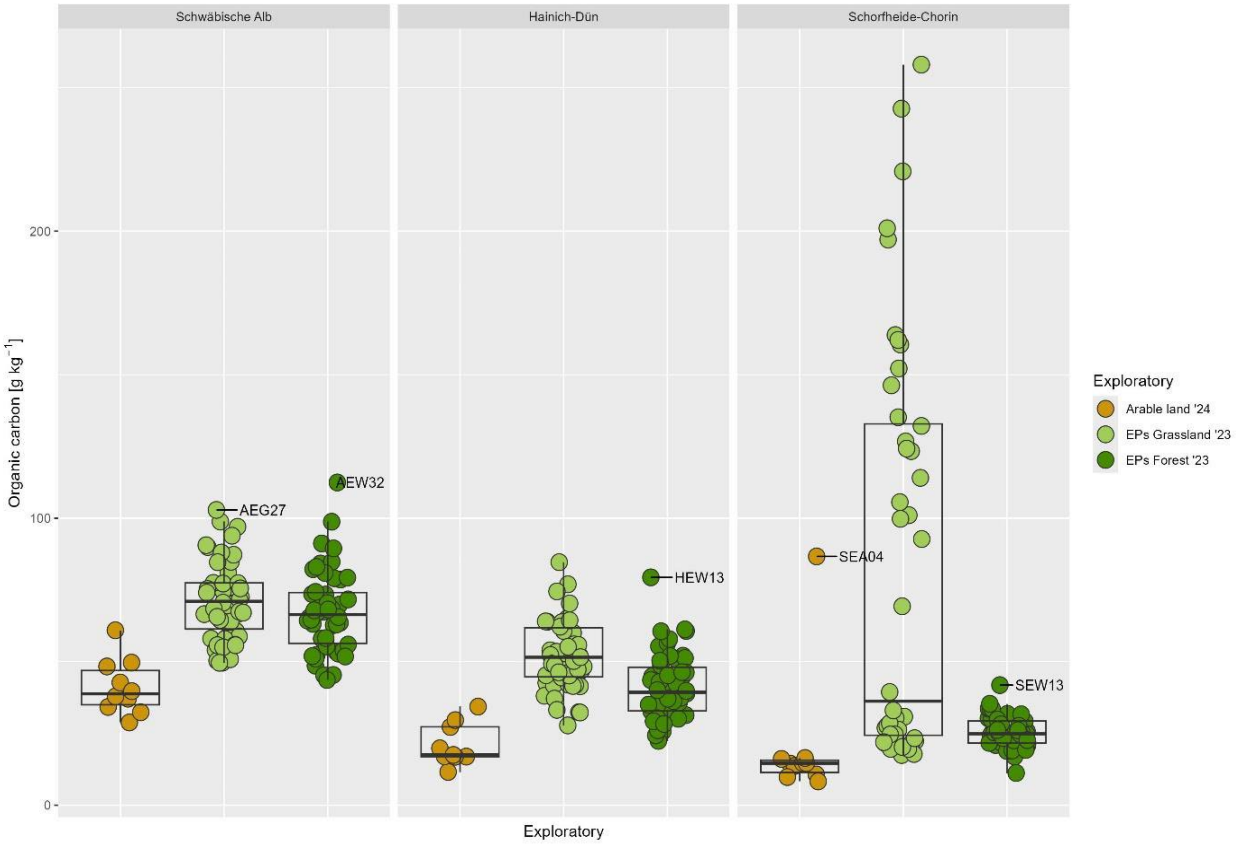

Fig. 4: Soil organic carbon (SOC) concentrations in arable field plots and in comparison with grasslands and forests across the exploratories.

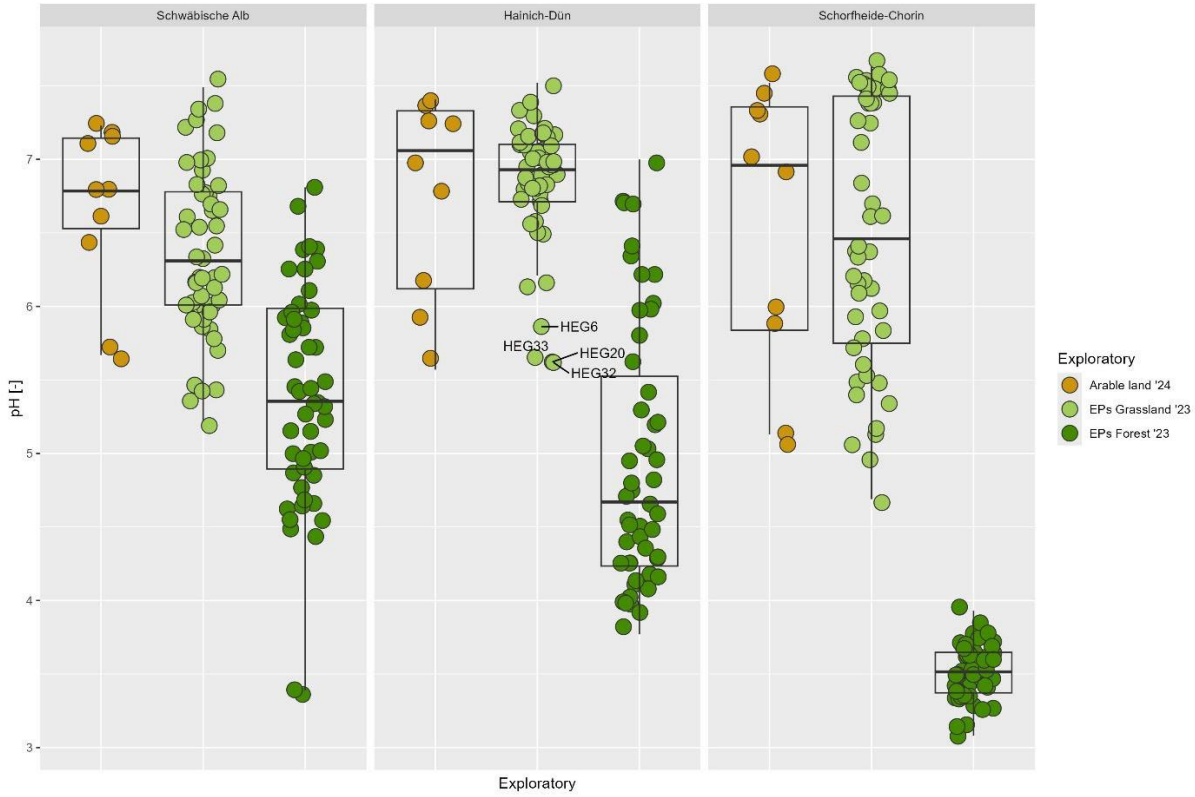

Fig. 5: Soil organic carbon (SOC) concentrations in arable field plots and in comparison with grasslands and forests across the exploratories.

CN ratios are rather similar in arable fields to those of grasslands, although they are on average slightly narrower. In contrast, **Olsen P** shows considerable differences between regions and land-use types, most likely due to variations in local and regional land-use history and differences in bedrock composition.

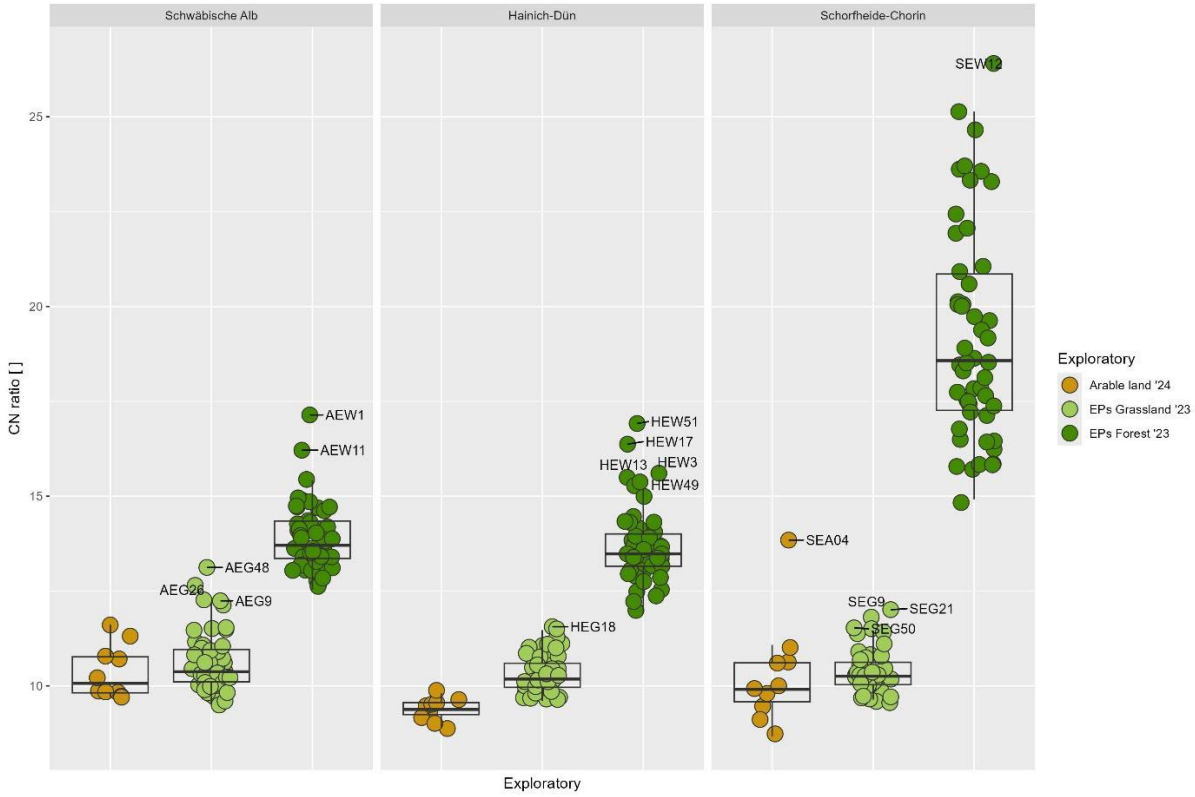

Fig. 6: Soil C/N-ratios in arable field plots and in comparison to grasslands and forests across the exploratories.

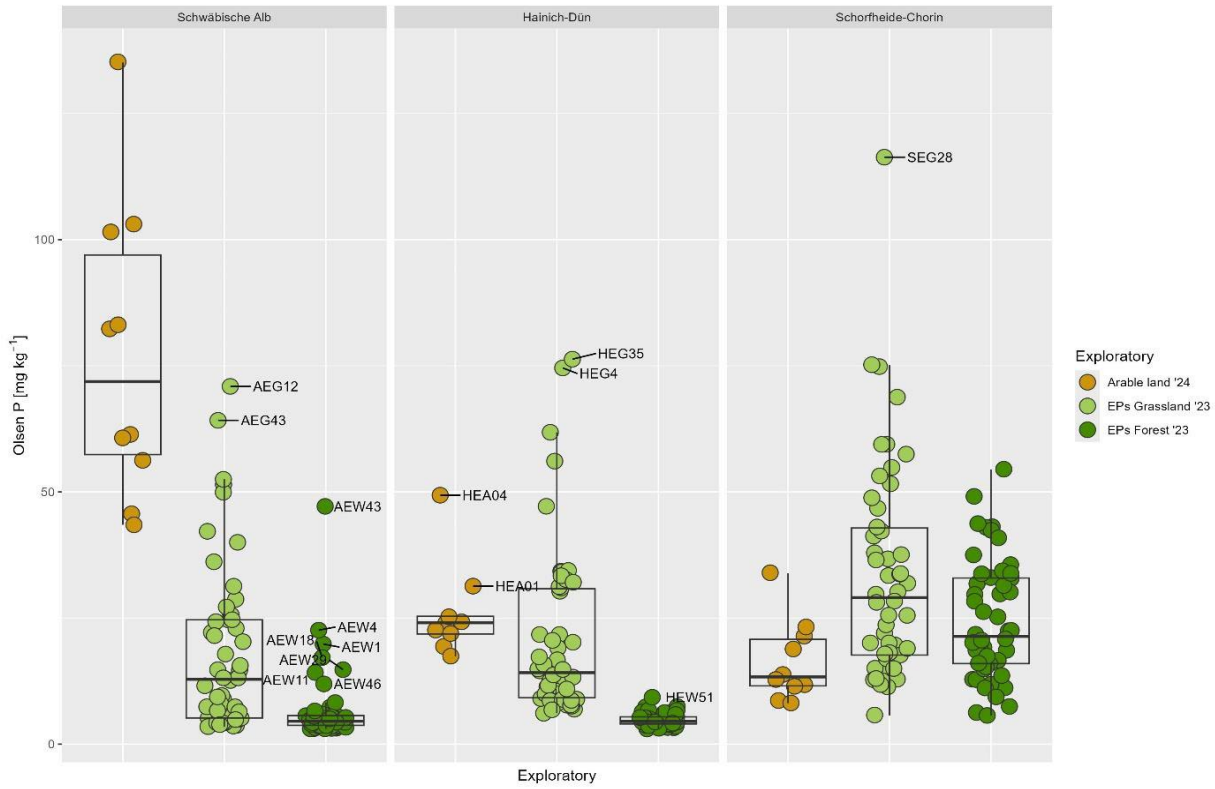

Fig.7: Soil Olson P concentrations in arable field plots and in comparison with grasslands and forests across the exploratories.

Microorganisms

Independent of Exploratory, agricultural sites appeared to be richer in soil bacteria and fungi than grassland or forest sites. There were less arbuscular mycorrhizal fungi (AMF) in agricultural sites than grassland sites, but more AMF than forest sites.

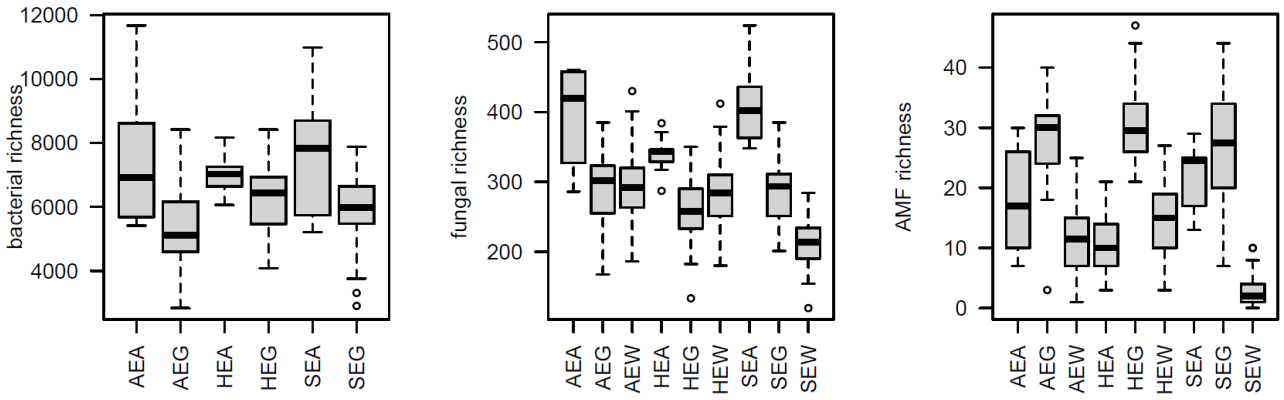

Fig. 8: Bacterial, fungi and AMF richness in arable field plots and in comparison with grasslands across the exploratories.