

Optimizing C inputs and through diversification. MIXROOT-C

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Introduction

Mixed species systems create opportunities for sustainable intensification of agriculture. Cover-crops (CC) and other mixed cash crop systems are currently less developed in the EU but provide a range of ecosystem service benefits, such as nutrient retention, improved biodiversity, increased below ground carbon allocation.

Currently they are cultivated on less than 10% of arable land area in Europe presenting ample opportunities for expansion. Little is known on the impact of cover crops on carbon flows, organic matter accumulation, soil moisture and the impact on GHG emissions in European agricultural soils.

We set out to explore some of the unknowns in a field experiment at the AGES site in Grabenegg in Austria.

Materials and methods

A rotation was established in a conventional farming system, with treatments of: **No, Low or High** diversity cover crops sown in the winter months. Main crop treatments were identical and full NPK rates applied. There were four replicates of each treatment set up in a randomized block design.

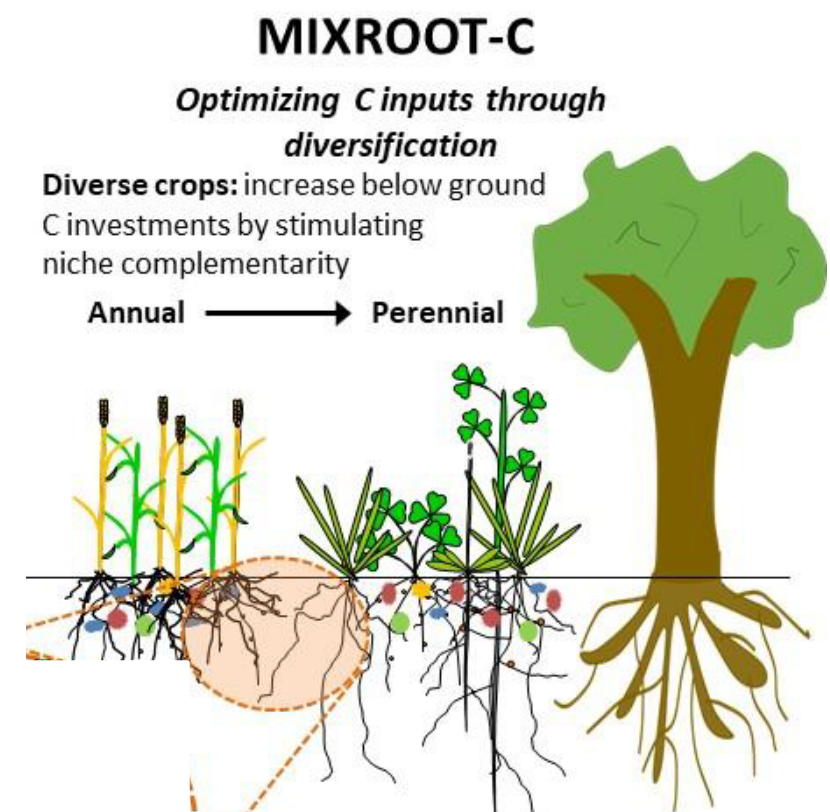
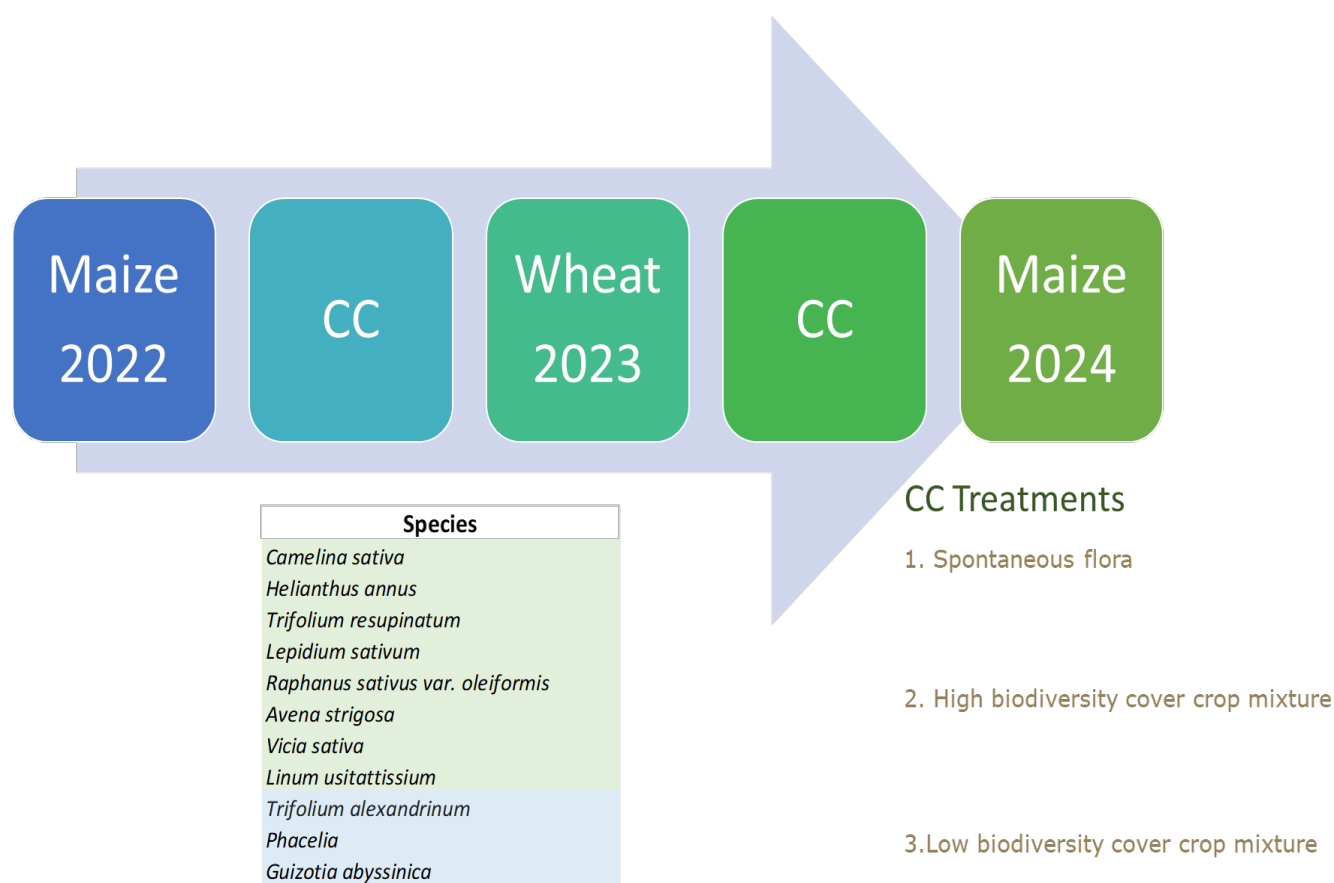
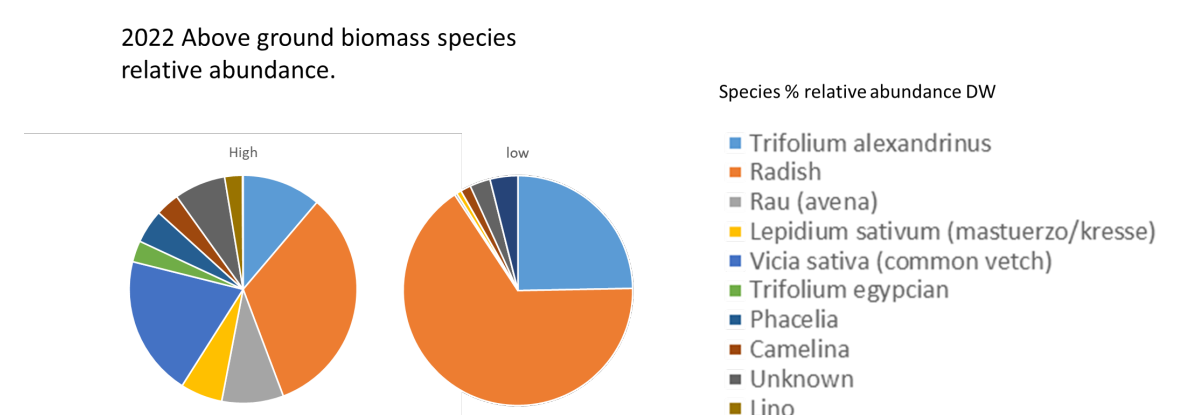


Figure 1. Rationale of the EU EJP-SOIL funded MixRoot-C.



Results

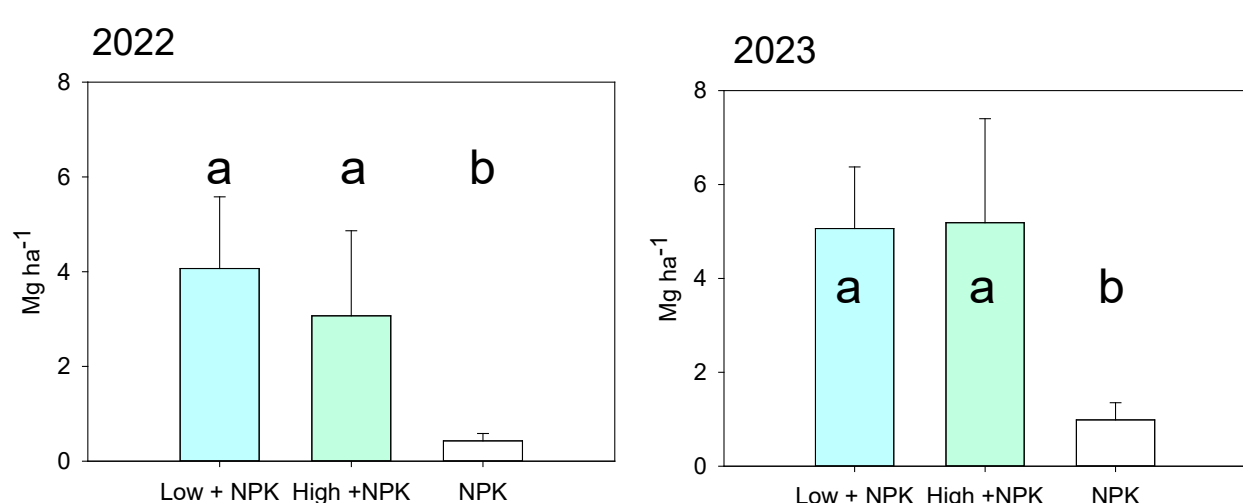
Cover-crops temporarily removed a significant amount of carbon dioxide from the atmosphere, over nine metric tons per hectare, with one third going to the roots.

Although little above ground biomass and recoverable fine root biomass remained in the following spring. Approximately 0.5 t of cover-crop macro recoverable root C remained in the soil.

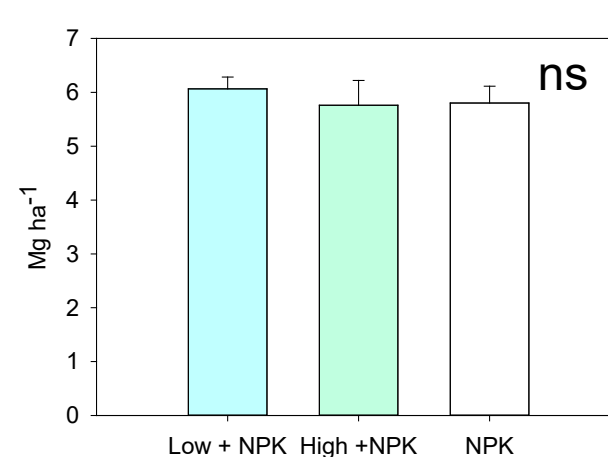
Cover-crop had no negative impact on following spring wheat yield or soil moisture content (data not shown).

Quantification of turnover and rhizo-deposition from cover-crops was identified as a major knowledge gap.

Cover-crop above ground biomass



Wheat grain yield 2023



Peak root biomass cover-crop

