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SoilBioHedge, harnessing hedgerow soil biodiversity for restoration of arable soil quality and resilience to climatic extremes and land use changes: The impacts of arable to ley conversion on soil hydrological properties

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Modern agricultural practices pose a significant threat to soil security. Continuous conventional cultivation has been observed to deplete soil organic matter, degrade soil structure, reduce water drainage and water holding capacity, increase nitrate leaching, damage the ecosystem engineer earthworm and mycorrhiza populations and increase the susceptibility of soil and crops to the impacts of climatic stress through decreased resilience to flood and drought conditions.

The SoilBioHedge project aims to determine the effectiveness of using grass-clover leys linking hedgerows to arable fields in restoring functional biodiversity, soil quality and resilience to drought and excess rainfall in arable farming. Paired 70m long ley strips have been inserted in to 4 fields. Within each field one ley is connected to the margin while in the other a small 1m fallow area and a steel mesh barrier inserted to bedrock is being used to disconnect the ley and margin and prevent macrofaunal movement from the margin to the ley.

As part of the SoilBioHedge project we are undertaking a range of analyses to establish the impacts of arable to ley conversion on key hydrological properties of agricultural soils. Soil moisture is being continuously monitored at three depths at 48 separate locations, in addition monthly manual measurements are being taken at 1158 locations. Arable-to-ley conversion is expected to increase soil macrofaunal activity especially in locations closer to hedgerows, enhancing macropore development. Therefore the proportion of water percolating into macropores, mesopores and micropores is being measured using tension infiltrometers which also allow the calculation of saturated hydraulic conductivity. Soil cores have been extracted to examine impacts on bulk and particle density and subsequently porosity, with hydraulic conductivity being measured using a lab permeameter.

Here we present the results of these analyses over the first 24 months of the project. This includes the impacts of this arable ley conversion on soil moisture dynamics and functional macroporosity.