EGU22-13528
https://doi.org/10.5194/egusphere-egu22-13528
EGU General Assembly 2022

Cover crops as a method of enhancing soil moisture and nutrient retention on arable farmland

Robert Thomas, Joshua Ahmed, and **Joshua Johnson**
Energy and Environment Institute, University of Hull, Hull, UK

Flooding affects >300 million people each year and causes loss of life, damage to infrastructure, and long-term mental and physical health problems. Across many parts of the globe, climate change is projected to increase the magnitude, frequency, and intensity of rainfall events, thus exacerbating future flood risk and increasing the demand for flood alleviation schemes. Agricultural land covers 39% of Europe, and as such intercepts a significant fraction of precipitation. Agricultural intensification has increased soil compaction and decreased soil porosity and permeability, thus decreasing infiltration, storage and groundwater recharge. Here, we report on experiments that aim to constrain the effects of using cover crops to increase soil porosity and permeability and hence decrease runoff during rainfall events in three arable fields in East Yorkshire, UK.

Half of each field was treated with a cover crop between harvest and winter cultivation, and the organic matter of this crop was incorporated into the soil. The second half of each field was used as a control. A suite of methodologies is being used to assess the long-term influence of this extra organic matter content on soil structure, health and permeability:

- An array of soil moisture loggers (Delta-T PR2/4, DalesLandNet MKII, GroPoint Profile 2625-N-T-4) was deployed in each field to provide long term soil moisture data at high temporal resolution;
- Roaming soil moisture measurements (Campbell Scientific HydroSense II) were used to increase spatial coverage and resolution;
- Laboratory measurements of soil density, ambient soil moisture content, porosity, permeability, and nutrient content (nitrogen, phosphorous and potassium); and
- A 3D MODFLOW model parameterised with collected data was used to assess the long term impact of increased soil porosity and permeability on rainfall transmission in to surface water drainage systems.

Preliminary results suggest that enhanced organic matter – delivered through cover crops – increases soil nutrient and moisture retention and decreases the peak flow stage in adjacent drainage channels after intense rainfall events. These observations suggest soil restoration may provide an important mechanism for attenuating flood peaks under future climate scenarios.