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## Characterising soil moisture regimes on poorly drained soils in Ireland using optical satellite derived vegetation indices and the OPTRAM model

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Soil drainage capacity is the degree and frequency at which the soil is free of saturation. It influences land use and management, soil nutrient cycling and greenhouse gas fluxes. Accurate information on drainage conditions is crucial for crop production and management and fundamental in developing strategies to adhere to environmental sustainability goals. This is particularly important in Ireland where approximately 50% of the soils are classified as “marginal”. These are mainly poorly drained soils which negatively impact plant growth and productivity.

Soil moisture acts as a proxy for drainage capacity. Timely and accurate information on soil moisture allows for precision management strategies. It aids in designing effective interventions on farms for artificial drainage works which are often assessed by information on soil moisture, soil type and hydrology. Such data are conventionally acquired by in-situ point sampling techniques which are costly and time consuming. Remote sensing has the potential to provide a solution by allowing simultaneous coverage of large geographic areas, quickly and in a cost effective manner.

This study uses optical remote sensing data from Sentinel 2 to derive information on soil moisture conditions on selected sites in Ireland. We develop the OPTRAM model of Sadeghi et al (2017) by exploring the use of remote sensing based vegetation indices such as the Normalised Difference Vegetation index, Enhanced Vegetation Index and Normalised Difference Red Edge Index for the years 2015-2020 along with short wave transformed infrared reflectance to estimate soil moisture variations for our study areas. We show that non-linear estimates of the wet and dry edge curves in the model are better suited for Ireland, which is dominated by wet conditions for most of the year and also identify the best vegetation indices for studying soil moisture variations.