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MSc thesis project: Multi-Sensor Calibration and Soil Water Dynamics Across Contrasting Textures

Summary

Accurate soil water monitoring with sensors is critical for precision agriculture, and to inform sustainable irrigation practises. However, default factory sensor calibrations frequently fail in non-standard soils due to variations in dry bulk density, organic matter content, and pore geometry. This master's thesis project establishes a controlled laboratory lysimeter experiment to calibrate and evaluate three distinct soil sensor technologies across three contrasting soil textures. The project results will inform field test with multiple sensors in irrigated crop on Gotland 2027.

Key Research Objectives are to i) test sensor pre-calibration functions with a range of wet -to dry soil moisture conditions, and ii) develop Soil Water Retention Curves (SWRC) and iii) explore any features of sensor dynamic response (hysteresis).





Methodological Overview: The study is laboratory based with lysimeters. Sensors will be tested for three soil textures, with high sand, high clay content, and one organic soil, with contrasting soil physical properties such as infiltration, bulk density and drainage properties.

Expected results will provide understanding of need for custom calibration Formulas depending on texture and soil moisture conditions. The experiment will also provide Fitted Hydraulic Parameters using e.g., van Genuchten parameters (α, n) ready for direct integration into hydrological models.

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