



# Sensors for Soil Moisture Monitoring in Ugandan Rice Crops: Precision Control and Cost Savings Through Internet of Things Technology

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## Abstract

Internet of Things (IoT) sensors are increasingly used for monitoring soil moisture in agriculture to optimise crop management and reduce water wastage. A comprehensive search of peer-reviewed journals, conferences, and grey literature was conducted to identify studies that utilised IoT sensors for soil moisture monitoring in Ugandan rice fields. Studies were selected based on predefined inclusion criteria related to methodological rigor, data quality, and relevance to the research question. The review identified a trend towards higher yields (up to 15%) associated with precise soil moisture control achieved through IoT sensors, indicating significant potential for cost savings in irrigation management. This systematic literature review highlights the effectiveness of IoT sensors in enhancing yield precision and reducing costs in Ugandan rice farming. The findings emphasise the need for further research to validate these results under varying climatic conditions and soil types. Further studies should be conducted to explore the long-term impact of IoT-based soil moisture monitoring on crop yields, water use efficiency, and economic benefits in Ugandan rice crops. Model estimation used  $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{rVert}^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *African geography, IoT sensors, precision agriculture, moisture sensing, sensor networks, data fusion, yield optimization*

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