

# PERFORMANCE OF AN IOT-BASED SMART IRRIGATION SYSTEM FOR SIMULATING SOIL MOISTURE STRESS

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Internet of Things (IOT) based irrigation systems are imperative for watering in precision agriculture and research applications. The accuracy of soil moisture sensors used in such IOT-based irrigation systems is low and needs to be estimated. Therefore, a study was conducted to evaluate the performance of an IOT-based smart irrigation system for simulating soil moisture stress in four growing media [topsoil:compost (2:1), topsoil:compost (1:1), reddish brown earth soil, and river sand] in a three-chamber controlled environment facility in a randomized complete block design. In a preliminary test, it was revealed that all drippers of the irrigation system released water at the same flow rate. Therefore, open/close decisions of solenoid valves were taken based on a single BGT-SM1 type soil moisture sensor coupled to the IOT-based smart drip irrigation system once required soil moisture is fluctuated. At 10%, 20%, 30%, and saturation, soil volumetric moisture content (VMC), and corresponding gravimetric soil moisture content were obtained in each media. Using 75% of the data, we fitted simple linear regression models to calculate the gravimetric soil moisture in a given VMC. The remaining data were used to validate the accuracy of the models. The sensors performed well in all four growing media giving 0.75–0.92  $R^2$  values for simple linear regression models irrespective of the variation in soil texture and compost content. Model validations revealed that errors associated with expected soil VMC and actual VMC were within the range of  $\pm 0.17$  to  $\pm 2.47$ . We conclude that this IOT-based SMART irrigation system could be used for simulating varying degrees of soil moisture in research experiments.

**Keywords:** Automated irrigation system, Smart drip irrigation, Precision agriculture, Soil moisture sensor