

# A Review Paper On Smart Irrigation System using Soil Moisture Sensor

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**Abstract:** *Efficient water management in agriculture has become a global priority due to increasing population, climate change, and freshwater scarcity. Traditional irrigation methods often lead to over-irrigation or under-irrigation, resulting in reduced crop productivity and wastage of resources. Smart irrigation systems integrated with soil moisture sensors offer a sustainable solution by monitoring soil water content in real time and supplying water only when required. These systems typically combine low-cost soil moisture sensors, microcontrollers, and automation units, and can be further enhanced with IoT connectivity, renewable energy sources, and machine learning algorithms for predictive irrigation scheduling. This review paper presents an overview of soil moisture sensor technologies, their integration into smart irrigation frameworks, benefits, challenges, and real-world applications. The findings indicate that soil moisture-based irrigation systems can significantly improve water-use efficiency, crop yield, and energy savings while reducing labor costs. Although issues such as sensor calibration, high initial investment, and connectivity in rural areas remain challenges, ongoing advancements in sensor design, IoT platforms, and artificial intelligence are expected to make these systems more reliable, affordable, and widely adopted in the future.*

**Keywords:** Smart Irrigation, Soil Moisture Sensor, Precision Agriculture, IoT-based Irrigation, Water Conservation, Sustainable Agriculture

