

ABSTRACT

This study aims to develop an automatic irrigation system based on the Internet of Things (IoT) integrated with fuzzy logic to regulate the timing and duration of irrigation for purple sweet potato plants using soil moisture and time data. The system consists of two microcontrollers communicating via the MQTT protocol, where one unit reads ambient temperature and soil moisture sensors, while the other controls the pump actuation and monitors water volume using a flowmeter. Irrigation decisions are determined by a fuzzy logic algorithm based on soil moisture values, with time references from the RTC module. The system was tested under three irrigation scenarios : daily, every three days, and no irrigation. Calibration results showed that the temperature sensor achieved 98% accuracy, the soil moisture sensor 97%, and the flowmeter 96% compared to manual measurements. The irrigation durations determined by fuzzy logic produced watering patterns aligned with the actual soil needs. Observations over two weeks recorded stem growth as follows: 38.13 cm (274.76%) with no irrigation, 26.13 cm (215.38%) with irrigation every three days, and 19.5 cm (132.20%) with daily irrigation. The system demonstrated adaptive watering behavior, lower soil moisture levels resulted in longer irrigation durations. With real-time monitoring and fuzzy-based decision-making, the system proved to be responsive, efficient, and easy to operate. This solution offers a practical approach to support smart agriculture, particularly for farmers, small-to-medium enterprises (SMEs), and the general public.

Keywords: *Internet of Things, fuzzy logic, automatic irrigation, soil moisture, purple sweet potato*