Monitoring Irrigation Volume with Sensor
Water Flow Sensor in Drip Irrigation System

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ABSTRACT

Drip irrigation is an efficient irrigation method and is widely applied in various regions, including Indonesia. This system waters plants using small-pore pipes and hoses that are placed above or below the soil near the plant roots, allowing the delivery of water and nutrients directly to the roots in the right amounts. Even though it is efficient, farmers often face challenges in providing nutrition according to plant needs, which can hinder optimal growth. The use of a Water Flow sensor is an effective solution to ensure that the nutrients provided are in accordance with the capacity required by the plant.

This research also evaluates the performance of Water Flow sensors in monitoring water volume in irrigation systems by comparing the water input volume on the TM221CE16R PLC and the water output volume measured using a measuring cup as a manual measurement tool. The test results show accuracy values in the form of percent error at various water volume capacities. Mean Absolute Percentage Error (MAPE) analysis is used to assess sensor accuracy. Based on data from five experiments with capacities of 1 to 15 liters, the highest MAPE value was found at an input volume of 1 liter with a value of 18%, while the lowest MAPE value was at an input volume of 15 liters with a value of 1.2%. The overall average MAPE value is 7%, which is in the very good category according to MAPE criteria (<10%). The implementation of Water Flow sensors in drip irrigation systems not only supports technology in crop cultivation, but also enables automatic control of land, ensuring optimal plant growth and productivity by precisely monitoring water and nutrient use.

Keywords*: Drip irrigation, Water Flow sensors FS400A G1, plant nutrition, water volume, PLC Schneider TM221CE16R, Mean Absolute Percentage Error (MAPE), plant cultivation, automatic control*