

ABSTRACT

The manual irrigation system in broccoli cultivation often faces challenges such as inaccurate watering schedules, overwatering or underwatering, and difficulty in monitoring field conditions in real time. These issues affect optimal plant growth and lead to water resource wastage. To address this, an Automatic Irrigation System Based on Environmental Sensors using Internet of Things (IoT) technology was developed to control irrigation according to the actual conditions of the field. The system utilizes an ESP32 microcontroller as the main controller, two soil moisture sensors to monitor moisture levels, one soil pH sensor, and one water pH sensor to assess irrigation water quality.

Sensor data is sent in real time to the Firebase Realtime Database. This database is accessed via an Android app that displays soil conditions and allows users to set automatic or manual watering. The automation mechanism is programmed with specific moisture limits. The solenoid valve activates when the soil moisture sensor reads between 39% and above 40% moisture, and it turns off if the moisture level exceeds that range. The system also records watering logs and allows for manual control via the app.

Test results show that the system can adjust irrigation duration and frequency based on environmental data, making it more efficient compared to manual methods. The Mobile application makes it easier for farmers to monitor field conditions and control irrigation remotely. With its modular architecture and stable performance, the system is considered feasible for implementation on a larger scale in broccoli farming as part of precision agriculture practices.

Keywords: automatic irrigation, environmental sensors, broccoli, ESP32, Firebase.