Hydroponic Farming using IoT

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Abstract: *This paper presents an automated hydroponic farming system powered by the ESP32 microcontroller, designed to optimize plant growth in controlled environments without soil. Leveraging IoT technologies and embedded systems, the setup integrates environmental sensors (EC, temperature, humidity, and light) to monitor key parameters in real-time. Python, Arduino IDE, and cloud-based data platforms are used to analyze data and enable remote control and monitoring. The system includes automated nutrient dosing, water circulation, and lighting control, all coordinated through the ESP32. Furthermore, the platform supports wireless connectivity for mobile alerts and dashboard visualization. By combining automation, wireless communication, and precision agriculture principles, this prototype offers an efficient, scalable, and sustainable solution for modern soilless farming.*

Keywords: Hydroponics, Smart Farming, ESP32, IoT, Sensor Automation, Precision Agriculture, Nutrient Monitoring, Sustainable Farming, Soil-less Cultivation