IoT Based Smart Agriculture Monitoring System

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Abstract: *Internet of Things This work introduces design and implementation of IoT-Based Smart Agricultural Monitoring System, which is entirely offline, to provide real-time environmental monitoring and automated irrigation in environments with no internet coverage. The system incorporates soil moisture, flame, and light-dependent sensors with a microcontroller to monitor vital field parameters and independently activate actuators like water pumps and DC motors. Power is provided by a solar panel and regulated with a buck converter and rechargeable battery, providing sustainable, continuous functionality. In contrast to traditional IoT systems that rely on cloud infrastructure, this approach prioritizes local decision-making, cost-effectiveness, and ease of installation, making it perfect for rural and remote applications. With modular design, scalability and customization are possible, providing an affordable, low-cost alternative to sophisticated commercial smart farming systems. Experimental results confirm the system's ability to maximize water efficiency, field safety, and environmental sustainability. The study shows the value of embedded, autonomous systems in solving critical issues in agriculture i.e., water scarcity, lack of labor, and crop susceptibility without needing costly infrastructure. The strategy encourages inclusive agricultural growth, especially in the neglected areas, and allows for future upgrades like mobile application integration, GSM-based SMS notifications, or predictive analysis via onboard storage.*

Keywords: Soil moisture sensor, Flame Sensor ,LDR sensor Concept of smart agriculture, IoT