## IJARSCT



International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 10, May 2025



## **Smart Water Pump Controller**

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Abstract: In the wake of increasing water scarcity and the need for sustainable agricultural practices, efficient irrigation management has become a critical concern, particularly in rural and remote areas. This project presents the design and implementation of an RF-Based Smart Water Pump Controller, aimed at providing farmers with a cost- effective, reliable, and user-friendly solution to remotely control irrigation water pumps. The system leverages LoRa (RYLR896) communication technologies to enable both short- and long-range wireless control, eliminating the need for GSM or internet connectivity. A ESP32 microcontroller serves as the central processing unit, managing command inputs and relay switching to operate the pump. Additionally, a LED-indicators provides real-time status updates, enhancing user interaction. The integration of LoRa modules ensures robust communication over distances up to 10 kilometers, making the solution ideal for large-scale farmlands. The proposed system not only reduces manual labor and water wastage but also lays the foundation for future expansion into IoT-based smart farming and environmental monitoring applications.

**Keywords**: RF-Based Smart Water Pump Controller, remote control, cost-effective, LoRa (RYLR896), wireless communication, long-range communication, ESP32 microcontroller, relay switching, LED indicators, real-time status, rural and remote areas, manual labour reduction, water wastage reduction, IoT-based smart farming



