

**DESIGN AND DEVELOPMENT OF A LoRa-BASED MASTER-SLAVE
SMART LIGHT TRAP ELECTRICAL CONTROL SYSTEM IN SOYBEAN
FIELDS**

Fendik Eko Purnomo, S.Pd., M.T. (*Supervisor*)

Septanda Tegar Mulianto

Mechatronics Engineering Technology Study Program

Department of Engineering

ABSTRACT

This study aims to design and implement a LoRa-based master-slave light trap electrical control system in soybean fields as a more effective and environmentally friendly pest control solution. The system was developed using an ESP32 microcontroller integrated with GY-521 sensors, raindrop sensors, RTC, relays, UV LEDs, insect electric trap modules, and LoRa SX1278 communication modules. The main power source of the device is supplied by solar panels and LiFePo4 batteries, enabling the system to operate independently without relying on conventional electricity. The research methods included literature study, system design, device assembly, simulation testing, and functional component testing. The results showed that all components functioned properly according to the designed system, both on the light trap master and light trap slave units. The system was capable of automatically controlling the lights and insect electric trap modules based on time and environmental conditions, as well as sending notifications when disturbances were detected on the device. The use of solar panels on both the light trap master and light trap slave units was sufficient to meet the daily energy requirements of the system. Through the implementation of IoT technology and renewable energy, this light trap is expected to help farmers reduce pesticide usage and improve the effectiveness of pest control in soybean cultivation.

Keywords: *Soybean, soybean pests, light trap, design, electrical control, renewable energy.*