

ABSTRACT

The development of Internet of Things (IoT) technology in agriculture offers great potential to improve land management efficiency, crop monitoring, and overall productivity. However, one of the main challenges faced in the field is the limited power supply for IoT devices, which still rely on conventional batteries or cables that require regular replacement. Therefore, wireless power solutions such as Wireless Power Transfer (WPT) play an important role in supporting the continuous operation of these devices in agricultural environments.

In this project, we design and implement a Wireless Power Transfer (WPT) system based on Magnetic Resonance Coupling (MRC) with two coils, specifically designed to work with IoT devices installed underground. The system is intended to wirelessly deliver power to IoT devices that monitor soil moisture, soil temperature, and battery capacity in agricultural settings. The design includes a transmitter and receiver unit, with testing carried out at certain distances to ensure compatibility, durability in soil conditions, and optimal power transfer efficiency to meet field requirements.

The testing results demonstrate that the proposed WPT system is capable of delivering a maximum output power of 6.1 watts with an efficiency of 72.6% at a resonant frequency of 14.4 kHz. This performance was achieved using a transmitter coil with 50 turns and a receiver coil with 150 turns, both constructed from 0.6 mm enamel wire with a diameter of 12.2 cm. The system successfully provided stable power to underground IoT devices and supported continuous monitoring of soil temperature and moisture. These results indicate that the designed WPT system is a promising and efficient alternative to conventional power methods for long-term agricultural IoT deployments.

Keywords: Agriculture, Efficiency, Internet of Things, Magnetic Resonance Coupling, Wireless Power Transfer