**Farming in the Digital Age: A Solar-Powered IoT Solution for Agriculture**

**Authors:**

Manish Meena Student ECE at Vit Bhopal University

Sachin Student ECE at Vit Bhopal University

Dr. Amit Kumar Singh Assistant professor SEEE at Vit Bhopal University

Rani Kushwaha Student ECE at Vit Bhopal University

Kajal Singh Student ECE at Vit Bhopal University

**Keywords:** Smart agriculture, Renewable energy, Real-time monitoring, Farm automation, Irrigation control, Energy efficiency, Environmental monitoring, ESP8266 microcontroller, WiFi module, Internet of Things (IoT).

**Abstract:** Climate changes, Soil degradation and water scarcity are the major challenges of the modern agriculture system as it makes farming unpredictable. It is important to adopt the modern technologies and innovative approaches to create a smart agriculture system that increases productivity and raises profitability. The Internet of Things (IoT) plays a significant role in developing a smart agriculture System. An IoT-based smart Agricultural system is a modern approach to managing irrigation that leverages the power of the Internet of Things (IoT). This research paper presents a smart agriculture system based on IoT (Internet of Things) technology that aims to improve the efficiency and productivity of agriculture. The system consists of various IoT devices such as sensors, actuators, and water pumps. The proposed system is designed to automate the irrigation process and provide real-time monitoring of soil moisture, temperature, and humidity. The NodeMCU ESP8266 development board is used to design this system. It is a low-cost, open-source Wi-Fi-enabled microcontroller board based on the ESP8266 SoC (System on Chip). The soil moisture sensor (FC-28) is used to measure the moisture content of the soil, and the data is transmitted wirelessly to the microcontroller which controls the water pump through the relay module to irrigate the crops accordingly.

In addition, the DHT11 sensor is used to measure the temperature and humidity of the environment, while the PIR sensor detects any unwanted intrusions in the crop fields. If any intrusion is detected, the buzzer will be activated to alert the farmer. The system is easy to install and requires minimal human intervention, making it ideal for farmers and agricultural organizations looking to maximize crop yield while reducing operational costs. The system can be controlled remotely using a mobile application, enabling farmers to monitor and control irrigation from anywhere in the world. This technology has the potential to revolutionize the way we manage our water resources and improve the sustainability of agriculture.