**LORA BASED SMART MONITORING DEVICES FOR AGRICULTURE**

# ABSTRACT

Traditional agriculture is remodeling into resourceful agriculture with the advancement of the internet of Things (IoT). Low-cost and low-power are the prime factors to make any IoT network advantageous and admissible to the farmers. In this paper, we have developed a low-power, inexpensive IoT network for smart agriculture. In this system we have designed, implemented and analyzed long range communication protocol in agriculture system which is capable of measurement of factors affecting production and quality of crops. We have created the model hardware and software architecture which can be used to increase the efficiency of agricultural management.

# INTRODUCTION

# The deployment of automated agricultural monitoring system has gained a great value in recent years due to its capacity to increase yields and to decrease water use. Water is distributed through a network of small tubes, pipes, and water storage tanks and it is then dripped steadily, but directly to the root .The uses of computers and electronics in the area of agriculture, specifically, in the irrigation systems have created new engineering and research challenges. In particular, wireless control of actuators for agricultural purposes has some technical difficulties because of the limited budget and power resources. However, in recent years, many different technologies have been developed to efficiently set up WSANs (Wireless Sensor and Actuator Networks). And many studies are conducted to examine their impact on transforming the agriculture. Over the years, techniques such as ZigBee™ and Bluetooth, have been prominent to establish low-power, short-range, multi-hop networks,which make use of the mesh network topology. Although these standards are considered low-cost systems, their restricted coverage (~100 meters) is a major drawback, that makes them difficult to be deployed in major irrigation systems. On the other hand, cellular networks, such as GSM or LTE, are capable of providing long range transmission to form WSANs, and they have been successfully tested to control irrigation systems, but solar panels are required for each node to compensate higher power consumption of cellular network. An another solution for building long-range, low-power and low-cost WSANs is the low-rate transmission technology, referred to as LPWAN (Low Power Wide Area Network). The main differences between LPWANs and the previous technologies are the use of long-range radio links, deployment of the star network topologies and lowrate data transmissions. Sigfox, Ingenu, NB-IoT, DASH7, and LoRaWAN are examples of LPWAN .

# All of those technologies have coverage distance of various kilometers and have their own advantages and limitations , in terms of the cost, scalability, power consumption, data rate and etc. Since the wireless control of drip irrigation requires very small data exchange, any of these network types can be used. Among them, Lora is relatively new technology on top of which the LoRaWAN protocol operates. It has the highest radio link budget and the best "cost vs. range vs. power tradeoff among its competitors. That is why, for this project, LoRa modem has been chosen as a radio link Currently, there is a lot of development in LPWAN networks. However, one technology cannot solve all challenges. Thus, LPWANs area unit deployed to handle solely some on challenges in IoT. LPWANs are specifically targeting things wherever extended coverage is most required, with low value of preparation, involving devices that area unit delay tolerant, don't would like a high data rates and require low power consumption network. In particular, monitoring of a system or conditions is a perfect case where LPWANs fit. The goal of the work is to integrate IoTs awareness and communication technology into an intelligent agriculture platform. The accuracies of sensors of various types are measured and these sensors are integrated into multi-functional sensor component. Then, multi-functional sensor components are integrated with Lora wireless network components. In this work an intelligent sensor network platform for agricultural applications is designed and constructed. In this study we have used Lora technology with outstanding advantages in transmission range and energy saving .In addition, in order to increase the stability of the system, we also propose to apply Master/Slave medium access control method for Lora network.

# OBJECTIVES

* + To reduce human effort and time efficiency.
  + Lora based Monitoring and Controlling System

# METHODOLOGY

The proposed framework manages the way toward monitoring and updating information management of irrigation area with the idea of IOT. The working model of **lora based smart monitoring devices for agriculture**contains the accompanying units and sensors:

* Arduino Uno
* Lora Modules
* Temperature Sensor
* Soil sensor
* DC Motor
* IR Sensor
* Alarm
* Water Level Sensor

**BLOCK DIAGRAM:**

**MONITORING SECTION:**

**Power Supply**

**ARDUINO**

**UNO**

**GPIO**

**ADC**

**IR Sensor**

**Water Level Sensor**

**Temperature Sensor**

**Soil Moisture Sensor**

**UART**

**LORA**

**CONTROLLING SECTION:**

**Power Supply**

**ARDUINO**

**UNO**

**GPIO**

**GPIO**

**LCD Display**

**BUZZER**

**UART**

**LORA**

**Relay with DC Motor**