Smart Irrigation Control System For Bangladesh Rice Research Institute

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Introduction

Bangladesh is a developing country. A significant amount of the countries economy depends on agriculture. Bangladesh is overwhelmed with technologies for development in every sector. However, There is hardly any technological improvement in the agricultural sector. Irrigation for rice cost a huge amount of natural resources. Each year the demand for rice is increasing to meet the excessive amount of population. The bad news is for the last 40 years we are using the same old irrigation technique to irrigate rice. Using Conventional method have following problems.

- 1 KG of rice production needs 3000 liters of water.
- Using the age-old method uses a massive amount of freshwater for irrigation
- Boro ensures 59% of total rice index of our country, so irrigation requires millions of tons of fresh water.
- International Rice Research Institute (IRRI) introduced a technology that can mitigate the excessive use fresh water for rice Irrigation.
- The technology is known as Alternate Wetting and Drying Technology (AWD).

Alternate Wetting and Drying (AWD)

- AWD is a perforated PVC pipe that allows the farmers to predict the correct time for irrigating rice.

  The tube is 10 cm in diameter and 30 cm long.
- The device stay inside the soil and field water seep through the hole into the PVC pipe.
- Based on the water level certain action will be taken for irrigation.
- AWD is mainly used during the vegetative period of the rice life cycle. The device will monitor the field

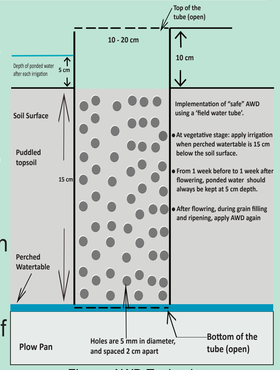


Figure: AWD Technology.

Methodology

Our target is to automate conventional AWD technology. By doing so, we will be able to improve the efficiency of AWD technology. Our proposed automation will help the farmer by providing flexibility in rice irrigation. The farmers will be able to monitor a large amount of rice field from a single place. The using of this technology will save valuable resourses such as water, fuel and electricity.

- The conventional AWD measures the water level using human interaction. Doing this takes a good amount of time and efforts to check each rice field individually.
- Our idea is to automate the AWD technology.

System Overview:

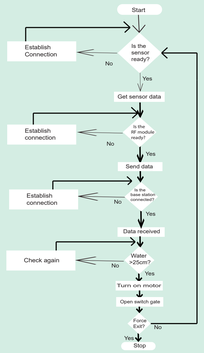
Field Monitoring Device:

- Arduino Pro Mini.
- Sensor: Sonar Sensor.
- RF Module (nrf24l01)
- Battery.

Base Station:

- NodeMCU.
- RF Module (nrf24l01)
- Battery.

System Flow Chart



Proposed System Architecture

- This is the diagram of our prototype field monitoring device we will implement with AWD.
- At the top of the device, there is a sonar sensor for measuring the water level from the field.
- Arduino Pro Mini will process this information
- RF module (nrf24l01) will transmit the data

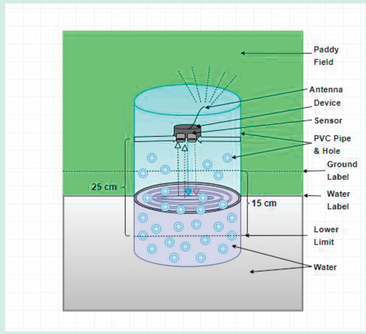


Figure: Project Field Monitoring device diagram

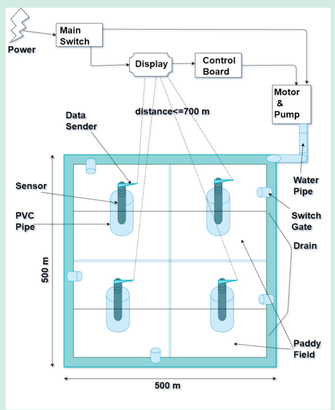
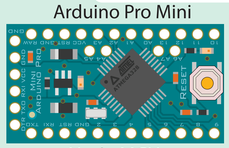


Figure: Project Field Monitoring system Overview

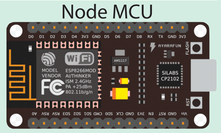
- The above mentioned devices are implanted in the fields here.
- All the field monitoring devices are sending data parallelly to the base station.
- If the water level is below the threshold value (10 cm + 15 cm = 25 cm), it will open the fields switch gate.
- Base station will turn on the motor for irrigating rice.
- Water will be transfered via main water supply ing drain and the irrigation will be provided.

Hardware Component

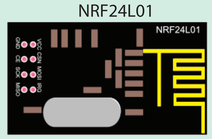
Arduino Pro Mini



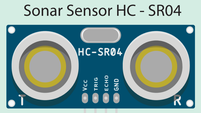
Node MCU



NRF24L01



Sonar Sensor HC - SR04



Circuit Diagram (Prototype)

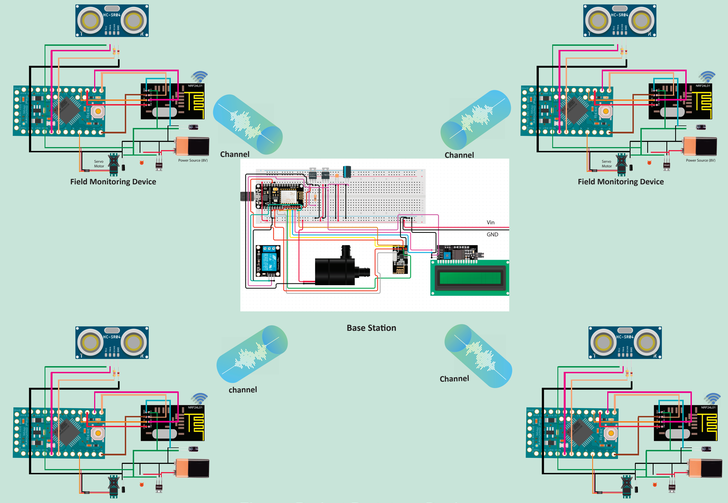
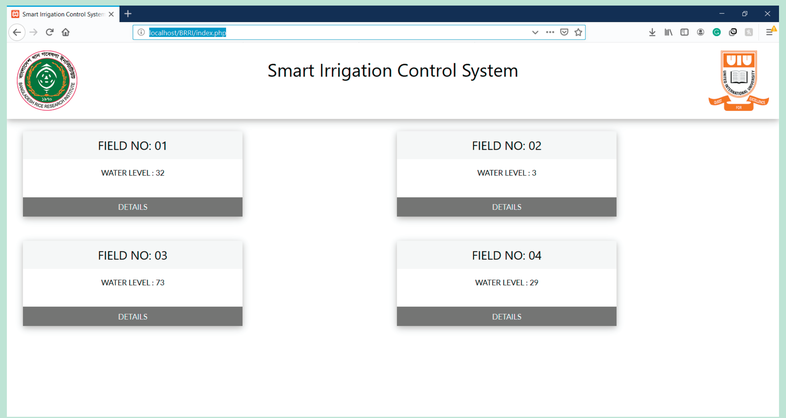


Figure: Project Prototype Device

Web Application



Results

The full project prototype was test against a real life scenario. For implementation purpose we selected our university field as a test area. The followings are the outcome of our project.

- Data successfully received from 300 meter distance including obstacle in between.
- The switch gate and submersible motor is working automatically for irrigation.
- A single device is capable of monitoring a maximum of 65 acre area.

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