



# EFFICIENT FARMING AND IRRIGATION SYSTEM FOR AGRICULTURE USING RASPBERRY PI

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## ABSTRACT

*This project focuses on implementing an agriculture monitoring system using raspberry pi kit. In conjunction with the population growth over last century, the need for finding new, more efficient, and sustainable methods of agricultural cultivation and food production has become more critical. To facilitate this process, we are designing, building, and evaluating a system for precision agriculture which provides farmers with useful data about the soil, the water supply, rodent identification agricultural field and the general condition of their fields in a user friendly, easily accessible manner. Our system aims to make cultivation and irrigation more efficient as the farmer is able to make better informed decisions and thus save time and resources. The diversity of location and climatic effects upon agricultural cultivation, along with other environmental parameters over time makes the farmer's decision-making process more complicated and requires additional empirical knowledge. Applying wireless sensor networks for monitoring environmental parameters and combining this information with a user-customized web service may enable farmers to exploit their knowledge in an efficient way in order to extract the best results from their agricultural cultivation*

**Keywords - Raspberry-Pi 3, Automation, Wireless Sensor Networks (WSNs)**

## LINTRODUCTION

This system focus on agricultural production and cultivation.Cold storage of fruits and vegetables was used extensively by our ancestors to keep food safe after the harvest season. In modern times, availability of fresh produce in the food industry has reduced the use of home storage. Often excess fruits and vegetables are kept in food industry, which cannot be consumed immediately but could store well. There is a need of maintaining the temperature and humidity of the environment, where the food is stored. It is necessary to monitor the temperature and humidity to assure maximum quality and minimum spoilage of the stored food in an effective



way. With the advent of low-power embedded systems and wireless networking, and also monitoring the presence of thrones in the storage, it is possible to implement in a reliable manner. The implementation of these networks is based on IOT

This overall process has a significant role in fulfilling the basic human need for food. The production, preparation, packaging, distribution, etc. of food also generates a lot of income.

The aim of this project is to exploit modern technologies and tools to improve monitoring and management of crops, in order to improve the efficiency and sustainability of farming and food production. To this end, we have designed a system for precision agriculture, which relies on a wireless sensor network combined with a service to provide individual farmers with access to data that they find useful. The system utilizes wireless sensor nodes that collect and transmit data about the quality of the water supply, the soil, and other parameters in an agricultural field. While such sensor-based systems have been investigated earlier, one of the key innovations to be explored in this project is the combination of these sensors systems with a service-driven business model to increase their ease of use and to amplify the gains that can be realized via an *integrated* system. The goal is to give a farmer a more complete picture of the current and historic crop status in order to foster better informed decision making. It is expected that such decisions will benefit *both* farming and irrigation by saving time and resources.

Factors such as the diversity of conditions which vary depending on location (for example weather, presence of insects, and disease) combined with the inability to predict the future characteristics of the environment during the different seasons over time complicate the decision making process and require specialized knowledge. This project is an attempt to bring some of these micro-environmental sources of information into the decision making process of farmers.

## II.LITERATURE REVIEW

After the research in agriculture field, researchers found that the yield of agriculture goes on decreasing day by day. We use of technology in the field of agriculture plays important role to increasing the production as well as reducing extra man power , water requirements.

A fully automation accessing of irrigation motor where Prototype includes number of sensors node placed in different directions of Polly house farm field. Each sensor is integrated with a wireless networking device and data received. The RASPBERRY Pi 3 is used for send message through internet [1].

Used closed loop irrigation system and determined irrigation amount based on distributed soil water measurements [2].

Irrigation systems can also be automated through information on volumetric water content of soil, using dielectric moisture sensors to control actuators and save water, instead of a predetermined irrigation schedule at a particular time of the day and with a specific duration [3].

The technological development in Wireless Sensor Networks made it possible to use in monitoring and control of greenhouse parameter in precision agriculture [4].

### III.SYSTEM OVERVIEW

GPIO Pinout Diagram



4 Squarely Placed Mounting Holes  
 40 GPIO Headers  
 SMSC LAN9514 USB Ethernet Controller

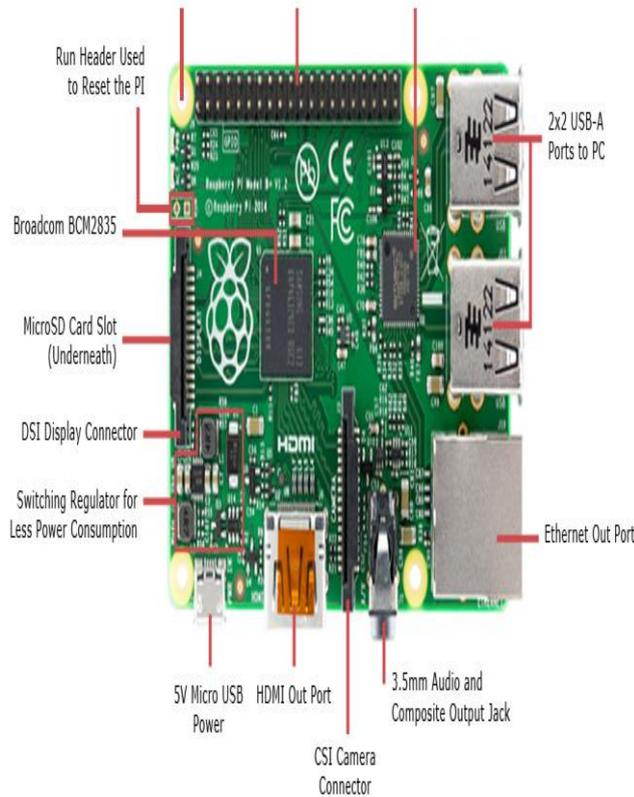


Fig.2. Pin Configuration of Raspberry pi ki

The block diagram of the proposed system as shown in Fig. 1 consists of different types of sensing

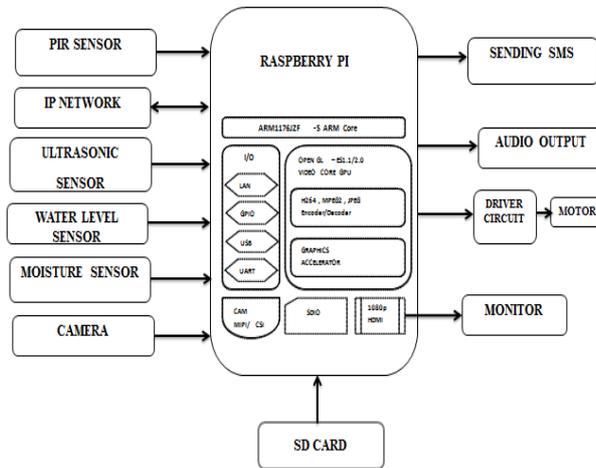


Fig.1. Block diagram of the proposed system

unit such as Soil Moisture Sensor to measure water content of soil, DHT11 is the Temperature and Humidity Sensor that detects the temperature and Humidity. Float sensor is device used to detect the level of water within a tank. The switch may be used in a pump, an indicator, an alarm .Sensor to measure the presence of water in air.

### 3.1 Component Description

#### 3.1.1. Power Supply:

One of the most exciting updates/upgrades of the new Model B+ is a fancy new power supply. The power supply is what takes the micro USB port voltage and creates the 5V USB, 3.3V, 2.5V and 1.8V core voltages. The 3.3/2.5/1.8 is for the processor and Ethernet.

#### 3.1.2 Sensors:

The Soil Moisture Sensor is used to measure the volumetric water content of soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture,

1. **Soil moisture sensor** can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, else the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.



2. **Ultrasonic sensor** sonic waves are best reflected from hard surfaces. Targets may be solids, liquids, granules or powders. ultrasonic distance sensor provides precise, non-contact distance measurements from about 2 cm to 3 meters.

3. **Water sensor** brick is designed for water detection, which can be widely used in sensing the rainfall, water level, even the liquid leakage. The brick is mainly comprised of three parts: An Electronic brick connector, a 1 MΩ resistor, and several lines of bare conducting wires

4. **Passive Infrareds sensors** (PIRs) are electronic devices which are used in some security alarm systems to detect motion of an infrared emitting source, usually a human body. The pyro electric sensor is made of a crystalline material that generates a surface electric charge when exposed to heat in the form of infrared radiation.

botany, and biology. Here DHT11 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds. DHT11 output calibrated digital signal. It utilizes exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability. Its sensing elements are connected with 8-bit single-chip computer.

#### IV. WORKING PRINCIPLE

Raspberry Pi is the heart of the system. In this project, webcam is interfaced to Raspberry Pi via Wi-Fi module. The Raspberry Pi Model B+ incorporates a number of enhancements and new features. Enhanced features are improved power consumption, increased connectivity and greater IO which made this powerful, small and lightweight ARM based computer. The Raspberry Pi cannot directly drive the relay. It has only zero volts or 3.3 V. It needs 12V to drive electromechanical relay. In that case it uses a driver circuit which provides 12V amplitude to drive the relay.

Sensors connected to the Raspberry Pi board give a resistance variation at the output. This signal is applied to the comparator and signal conditioning circuit which has potentiometer to decide the moisture level above which the output of comparator goes high. This output signal is given to the Raspberry Pi board. If the soil moisture value is above the moisture level then the 3 phase induction motor will be OFF, whereas if the moisture level is low motor will be ON through the relay. For monitoring the farm at night LDR is used which controls the light automatically.





3. Less energy usage.
4. Save water
5. To improve efficiency and sustainability of farming.

## VII.APPLICATIONS

1. This system is useful for monitoring all activities related to farming
2. Also useful to track the growth of plant
3. This system maintains the moisture level to maintain the steady growth of plant so that production will be maintained.
4. System will monitor the soil moisture level to control the drip irrigation system.
5. This system is also useful to supply liquid fertilizers, for this purpose level maintenance of water and liquid fertilizer will be maintain.

## VIII.CONCLUSION

The agricultural monitoring system that will be implemented would be feasible and cost effective for optimizing water resources for agricultural production. The system would provide feedback control system which will monitor and control all the activities of drip irrigation system efficiently. This irrigation system will allow cultivation in places with water scarcity thereby improving sustainability. Using this system, one can save manpower, water to improve production and ultimately increase profit.

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