

# Wireless Crane For Smart Cultivation

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**Abstract**—In today's world farming accounts for around 70% of water usage. Many of the irrigation system in place do not use the water in the most efficient way. Poor irrigation led to water loss, waterlogging and salinization of nearly 10% of world's irrigation land, thereby reducing productivity. The green house based modern cultivation system is the recent requirement in every part of India. In this project the seed container present in the wirelessly operated travelling crane (WOT) moves in a predefined path and sow the seeds at the pre-defined distance and water is poured. These operations are done in remote controlled manner (using RF transmission). The sensors are used to monitor the water level, variable atmospheric conditions and this information is transmitted wirelessly. Based on the received information the pump motor will turn ON and OFF automatically.

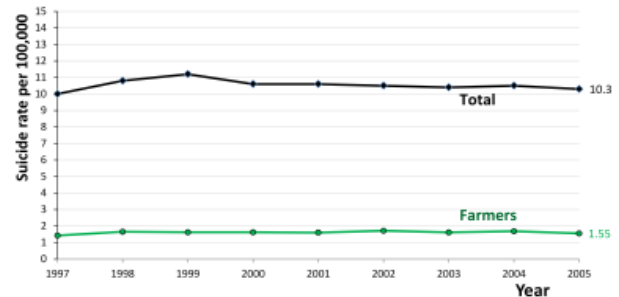
## I. INTRODUCTION

The history of Agriculture in India dates back to Indus Valley Civilization Era and even before that in some parts of Southern India. Today, India ranks second worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 13.7% of the GDP (gross domestic product) in 2013, about 50% of the workforce. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India.

India exported \$39 billion worth of agricultural products in 2013, making it the seventh largest agricultural exporter worldwide and the sixth largest net exporter. Most of its agriculture exports serve developing and least developed nations. Indian agricultural/horticultural and processed foods are exported to more than 100 countries, primarily in the Middle East, Southeast Asia, SAARC countries, the EU and the United States. For decades, agriculture has been associated with production of essential food crops. At present, agriculture above and beyond farming includes forestry, dairy, fruit cultivation, poultry, etc. Today, processing, marketing and distribution of crops and livestock products etc. are all acknowledged as part of current agriculture. Thus, agriculture could be referred to as the production, processing, promotion and distribution agricultural products. Agriculture plays a critical role in the entire life of a given economy. Agriculture is the backbone of economic system of a given country.

In today's situation the farmer suicide has increased. Various reasons have been offered to explain why farmers commit suicide in India, including: floods, drought, debt, use of genetically modified seed, public health, usage of lower quantity of pesticides due to less investments produce a decreased yield and also government economic policies. There is no consensus on what the main causes might be but studies show suicide victims are motivated by more than one cause, on average three or more causes for committing suicide Panagariya states, "farm-related reasons get cited only approximately 25 percent of the time as reasons for suicide" and "studies do

consistently show greater debt burden and greater reliance on informal sources of credit" amongst farmers who commit suicide. The National Crime Records Bureau of India reported in its 2012 annual report, that 135,445 people committed suicide in India, of which 13,755 were farmers (11.2%). Of these, 5 out of 29 states accounted for 10,486 farmers suicides (76%) – Maharashtra, Andhra Pradesh, Karnataka, Madhya Pradesh and Kerala.



Farmer's death rate

Globally, the agricultural sector consumes about 70% of the planet's accessible freshwater. Many big food producing countries like the US, China, India, Pakistan, Australia and Spain have reached, or are close to reaching, their renewable water resource limits. Globally, the agricultural sector consumes about 70% of the planet's accessible freshwater more than twice that of industry (23%), and dwarfing municipal use (8%).

The main causes of wasteful and unsustainable water use are:

- ✓ leaky irrigation systems
- ✓ Wasteful field application methods
- ✓ Cultivation of thirsty crops not suited to the environment.

The problem is made worse by misdirected subsidies, low public and political awareness of the crisis, and weak environmental legislation. Of the total irrigated area worldwide 38% is equipped for irrigation with groundwater, especially in India (39 million ha), China (19 million ha) and the United States of America (17 million ha).

Total consumptive groundwater use for irrigation is estimated as 545 km<sup>3</sup>/year. Groundwater use in irrigation leads in places to exploitation of groundwater at rates above groundwater recharge and depletion of groundwater reservoirs. Irrigable and irrigated areas alone give no complete indication of the intensity of water use, which also depends on the type of equipment used:

- Surface irrigation
- Sprinkler irrigation
- Drip irrigation

Sprinkler and drop irrigation methods are less water-intensive than surface irrigation, which still predominates in some countries. Equipment for drop irrigation is more expensive than for other irrigation methods and this system therefore tends to be concentrated in areas with high-value crops. Surface irrigation is also called 'flood irrigation' i.e. the leading of water along the ground, either by flooding the whole

area or leading the water along small furrows between the crop rows, using gravity as a force. Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops which fall to the ground. The pump supply system, sprinklers and operating conditions must be designed to enable a uniform application of water.



Drip irrigation is a form of irrigation that saves water and fertilizer by allowing water to drip slowly to the roots of many different plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. It is done through narrow tubes that deliver water directly to the base of the plant. It is chosen instead of surface irrigation for various reasons, often including concern about minimizing evaporation. Drip irrigation is used in farms, commercial greenhouses, and residential gardeners.

## II. LITERATURE REVIEW

### 1. Smart Irrigation System

The smart irrigation system was developed to optimize water use for agricultural crops. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants. In addition, a gateway unit handles sensor information, triggers actuators, and transmits data to a web application. The system was powered by solar panels and had a duplex communication link based on a cellular-Internet interface that allowed for data inspection and irrigation scheduling to be programmed through a web page.

### 2. Irrigation System Using a wireless sensor network and gprs

Optimum use of water is main objective of this irrigation system to reduce water consumption. Here temperature and soil moisture sensors and water level can be monitored on web page through micro controller. The web-server is connected to the internet. By typing the IP-address on the web browser, the owner gets a web page on screen. This page contains all the information about the status of the sensors and ON/OFF status of the motor.

## III. METHODOLOGY

### A. TRANSMITTER SECTION

In the transmitter section, by using keypads commands are given for the movement of the crane. This information is then transmitted through RF transmission to the receiver.

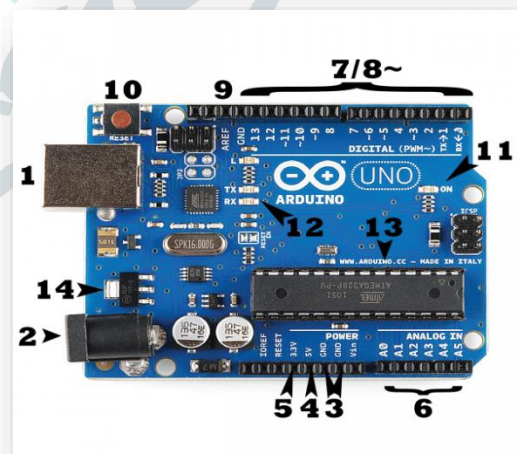
### B. RECEIVER SECTION

The RF receiver receives the command from the transmitter and the crane moves accordingly. The various sensors namely the temperature sensor, humidity sensor and soil moisture sensor observe the surrounding environment periodically. According to the sensor reading, the irrigation is controlled. The relay is used to control the movement of the crane. The pump motor is used for watering. The valve used is responsible for the opening and closing of the seed container.

## IV. HARDWARE DESCRIPTION

### 1. Arduino Microcontroller

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

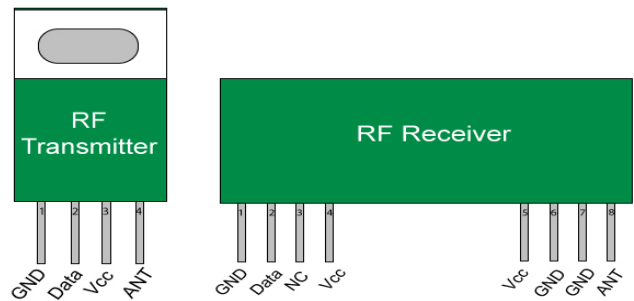
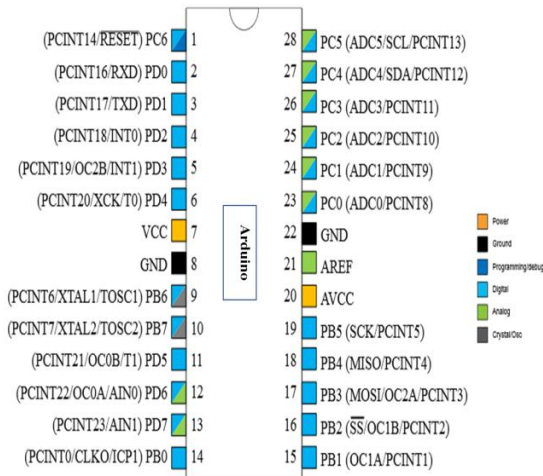


### 2. Atmega 328 microcontroller

The Atmel Picopower ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to

1MIPS per MHz. This empowers system designer to optimize the device for power consumption versus processing.

encoder/decoder pair ICs. The transmitter circuit comes with encoder IC (H12E), this IC can be interfaced with RF transmitting antenna and information can be sent in encoded form. The receiver circuit comes with decoding IC (H12D), this IC can be interfaced with RF receiving antenna and information can be received can be decoded.



### 5. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.



### 3. Keypad

A keypad is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters. If it mostly contains numbers then it can also be called a numeric keypad



### 6. DC motor

The DC motor is used to provide the mechanical movement to the vehicle by converting the electrical energy into mechanical movement.

### 4. RF transmitter and receiver module

RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (T x/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT 12E- HT 12D, HT640-HT648, etc. are some commonly used





**7. Temperature sensor**

A thermistor is a ceramic semiconductor which exhibits a large change in resistance with a change in its body temperature. The word thermistor is actually a contraction of the words "THERMAL RESISTOR". Although there are both positive coefficient (PTC) and negative coefficient (NTC) are available, for our application we use negative coefficient(NTC) type thermistor.



**8. Humidity sensor**

The humidity sensor used here is HS15P. It is used to observe the humidity in the surrounding environment. It is a non refreshing type humidity sensor made of polymer. It is a water resistant type.



**9. Soil moisture sensor**

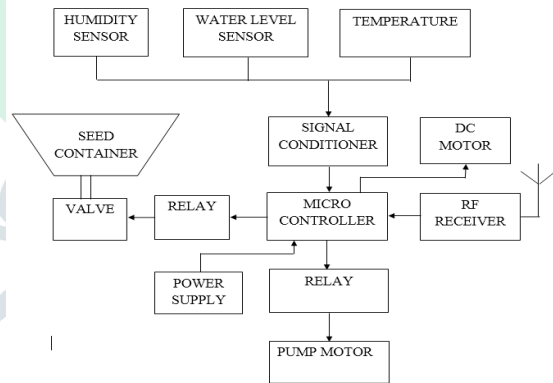
The Soil Moisture Sensor is used to measure the volumetric water content of soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and biology. The Soil Moisture Sensor uses capacitance to measure the water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

**V.BLOCK DIAGRAM**

**TRANSMITTER SECTION**



**RECEIVER SECTION**



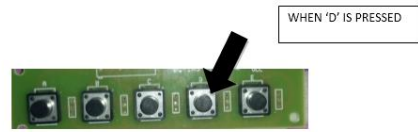
### VI.OUTCOMES

STEP 1:



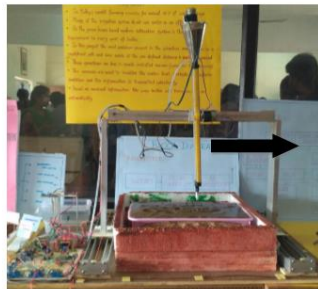
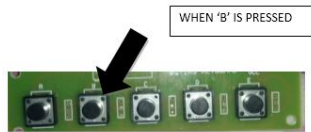
AUTOMATIC SEED SOWING TAKES PLACE

STEP 4:



THE CRANE MOVES FORWARD

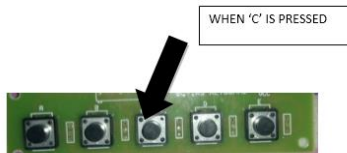
STEP 2:



THE SEED CONTAINER MOVES TOWARDS LEFT

STEP 5:

STEP 3:



THE SEED CONTAINER MOVES TOWARDS THE RIGHT



THE CRANE MOVES BACKWARD

## VII.CONCLUSION

This project aims at the promotion of cultivation in agricultural land. It also aims in modernising the seed sowing pattern, reducing the work of farmers. This project prevents the wastage of water by implementing smart irrigation. The atmospheric conditions are monitored continuously and the field is irrigated accordingly thus preventing wastage. It can be operated easily by anyone.

## VIII.REFERENCES

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