PROJECT REPORT

ON

“Digital Agriculture”

SUBMITTED TO

The New College, Kolhapur

FOR THE DEGREE OF

B.Sc.

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BY

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INTRODUCTION

Digital agriculture refers to the use of agriculture technology, or AgTech, to integrate agricultural production from the paddock to the consumer. These technologies can provide the agricultural industry with the tools and information to make more informed decisions and improve productivity.

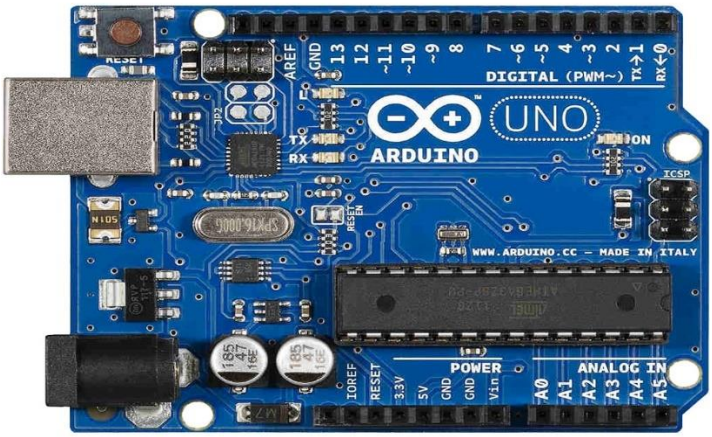
Digital agriculture, sometimes known as smart farming or e-agriculture,is tools that digitally collect, store, analyze, and share electronic data and/or information in agriculture. The Food and Agriculture Organization of the United Nations has described the digitalization process of agriculture as the digital agricultural revolution.

Component list:

Sr. No	Components	Prize
1.	Arduino Uno	450/-
2.	16x2 LCD	120/-
3.	12v amplifier	90/-
4.	Male/female strips	75/-
5.	Buck strips	20/-
6.	12v relay (3)	39/-
7.	IC 4007	3/-
8.	IC 548	3/-
9.	LM-35	60/-
10.	Pump motor	80/-
11.	LDR	20/-
12.	Geared motor(2)	360/-
13.	16 pin base	2/-
14.	Nut-bolts	140/-
15.	Plastic box	80/-
16.	Plastic jar	40/-
17.	Wooden shed	1100/-
18.	Soil moisture sensor	90/-
19.	Rain sensor	90/-

Component Description:

Arduino Uno Board:



The Arduino Uno is an open-sourcemicrocontroller board based on the MicrochipATmega328P microcontroller and developed by Arduino.cc The board is equipped with sets of digital and analog input/output (1/0) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital 1/0 pins (six capable of PWM output), 6 analog 1/0 pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery,though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo.

Technical specification:

- Microcontroller: MicrochipATmega328pl7
- Operating Voltage: 5 Volts Input Voltage: 7 to 20 Volts
- Digítal I/O Pins: 14 (ofwhich 6 can provide PWM output)
- PWM Pins: 6 (Pin # 3. 5. 6. 9. 10 and 11))
- UART:
- 12C: 1
- SPI: 1
- Analog Input Pins: 6

- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB ofwhich 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM I KB
- Clock Spoed. 16 MIt
- Length 68.6 mm
- Width. 53.4 mm
- Weight: 25 g
- ICSP Header Yes
- Power Sources: DC Power Jack & USB Port

16x2 LED Display:

16×2 LCD is one kind of electronic device used to display the message and data. The term LCD full form is Liquid Crystal Display. The display is named 16×2 LCD because it has 16 Columns and 2 Rows. it can be displayed (16×2=32) 32 characters in total and each character will be made of 5*8 Pixel Dots. These displays are mainly based on multi-segment light-emitting diodes. There are a lot of combinations of display available in the market like 8×1, 8×2, 10×2, 16×1, etc. but the 16×2 LCD is widely used. These LCD modules are low cost, and programmer-friendly, therefore, is used in various DIY circuits and devices.

Relay:

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity

flows through it). In this relay, when a current flows through the coil, it turns it into an electromagnet. The magnet pushes a switch to the left, forcing the spring contacts together, and completing the circuit they're attached to.

Diode 4007:

The 1N4007 is a PN junction rectifier diode that comes from the 1N400x series. There are other similar dlodes from 1N4001 to 1N4007 and the only difference between then is the max repetitive reverse voltage. The 1N4007 is electrically compatible with other rectifier diodes and can be used instead of any diode of the 1N400X series. The 1N4007 has various applications in real life. For example, applications of freewheeling diodes, general rectifying of power supplies, inverters, converters, etc.

Pump Motor:

This is a low cost mini submersible type water pump that works on 3-6V DC. It is extremely simple and easy to use. Just immerse the pump in water, connect a suitable pipe tothe outlet and powerthe motor with 3- 6V to start pumping water. Great for building science projects, fire-extinguishers, fire fighting robots, fountains, waterfalls, plant watering systems etc. This motor is small, compact and light. It can be controlled from a micro controller/Arduino using our DC Motor Drivers or one of our Relay Boards. You may use our 5V SMPS Power Supply Adapter to run this pump. You may also use our 6V Solar Panel to run the pump with appropriate a 6V voltage regulator.

Motor:

A DC motor is any of a class of rotary electrical motorsthat converts direct current (DC) electrical energy into mechanical energy The most common types rely on the forces produced by magnetic fields Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the mator. DC motors were the first form of mator widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances.

LM-35:

LM35 is a commonly used in temperature sensor, It shows values in the form of output voltage instead of degree celsius.

It does not require any external calibration circuitry.

LM35 shows high voltage values than thermocouple and may not need thatthe output voltage is amplified

The sensitivity of LM35 is 10mV/degree celsius. As the temperature increases, the output voltage also increases.

One ofthe most important characteristics is that it draws just 60uA from its supply and acquires a low heating capacity.

The output voltage is always is proportional to the Celsius temperature. The scale factor is.01 V/C

LDR:

A Light Dependent Resistor lalso known asaphotoresistor or LDR) is a device whose resistivity isa function of the incident electromagnetic radiation. Hence, they are light-sensitive devices. They are also called as photoconductors, photoconductive cells or simply phatocells. They are made up of semiconductor materials that have high resistance. There are many different symbols used to indicate a phatoresistor or LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it.

Rain Sensor:

A sensor that is used to notice the water drops or rainfall is known as a rain sensor. This kind of sensor works like a switch. This sensor includes two parts like sensing pad andasensor module. Whenever rain falls on the surface of a sensing pad then the sensor module reads the data from the sensor ped to process and

convert it into an analog or digital output 2 So the output generated by this sensor is analog (AO) and digital (DO).

The specifications of rain sensors like different parameters with values are mentioned below.

- Operating voltage ranges from 3.3 to SV.
- The operating current is 15 mA.

The relation among the calculated property as well as moisture of soil should be adjusted & may change based on ecological factors like temperature, type of soil, otherwise electric conductivity The microwave emission which is reflected can be influenced by the moisture of soil as well as mainly used in agriculture and remote sensing within hydrology.

These sensors normally used to check volumetric water content, and another group of sensors calculates a new property of moisture within soils named water potential. Generally, these sensors are named as soil water potential sensors which include gypsum blocks and tensiometer.

The FC-28 soil moisture sensor includes 4-pins

- VCC pin is used for power.
- A0 pin is an analog output.

- DO pin is a digital output .
- GND pin is a Ground.

The specification of this sensor includes the following

- The required voltage for working is 5V
- The required current for working is < 20mA
- Type of interface is analog

Wooden Slab:

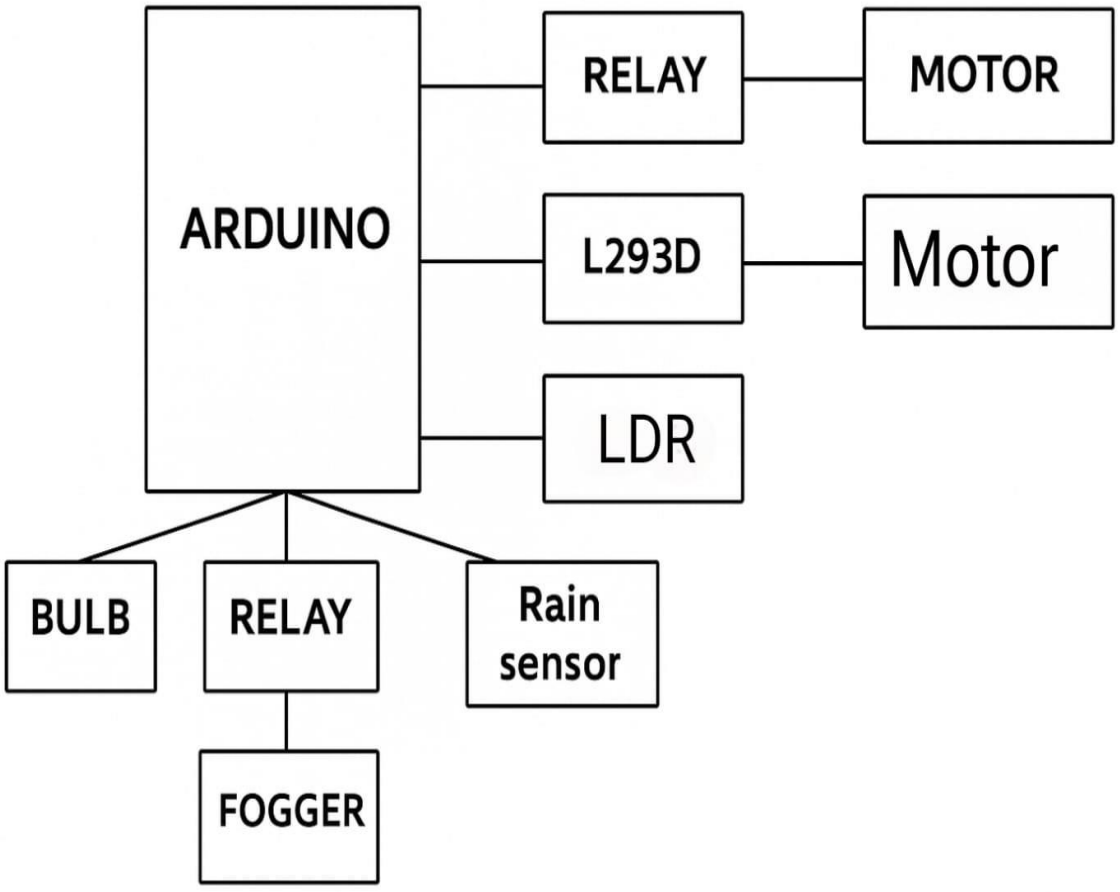
This slab is made from wood. So it is known as wooden slab.

According to length and breadth of our farm, we can chande the length and breadth of slab. We can use this slab in farms to protect our crap from rain and sun radiations. It works like a protection shield to farm area. It is made from wood, so it acts like a insulator and there is no danger from it.

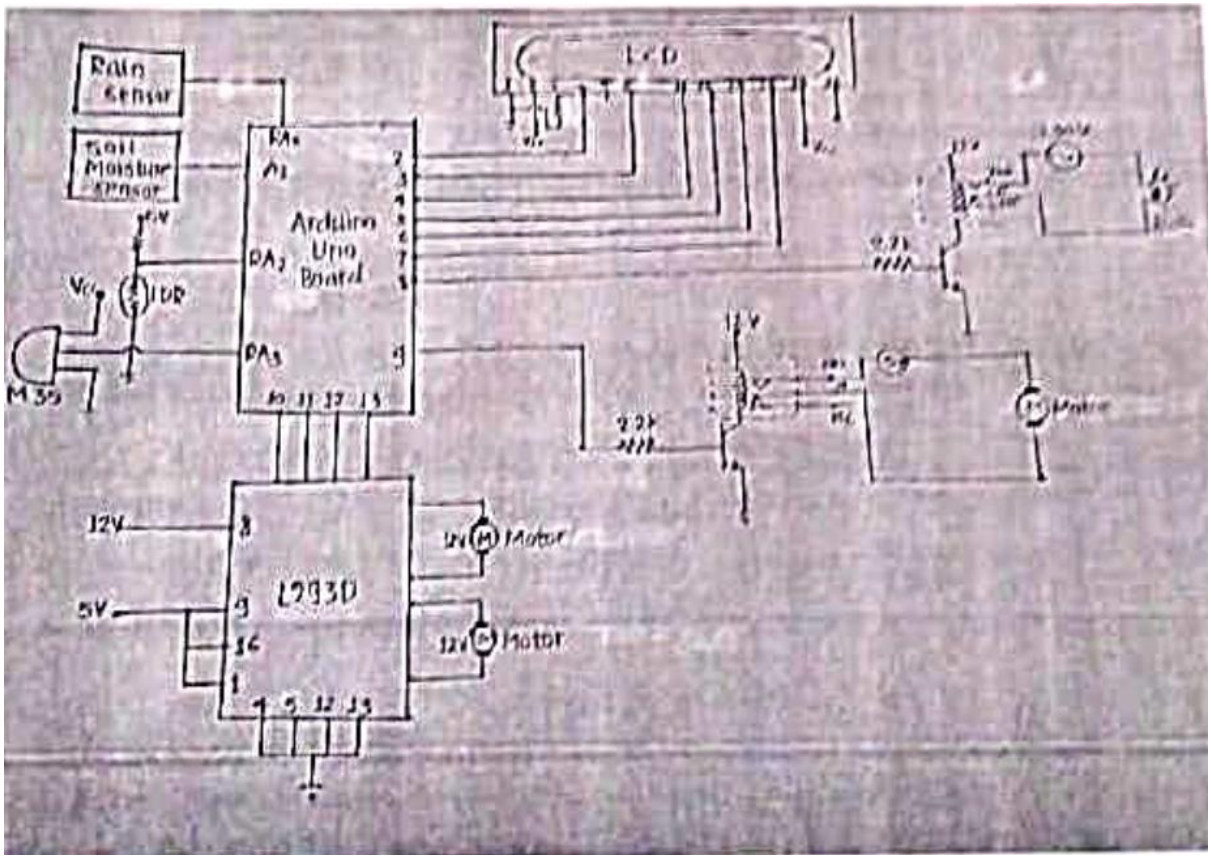
Resistors:

A resistor (also known as an electrical resistor) is defined as a twoterminal passive electrical element that provides electrical resistance to current flow. Resistance is a measure of the opposition to the flow of current in a resistor.

Block Diagram:



Circuit Diagram:



Working:

In this prototypical module, 4 techniques are used to perform digital agriculture.

1.Water Irrigation System: .

- It refers to the operation of the system with no or just a minimum of manual intervation beside the surveillance.
- This system automated with the help of timers, sensors, Arduino, and mechanical appliances.
- The main intension of this project is to develop an automatic irrigation system in the field of agriculture.
- Required components: Arduino Uno, relay, water pump, diodes,amplifier, capacitors, resistors, LED, soil moisture sensor, and crystal sensor.
- The most obvious benefits of an irrigation system is protecting our crop from the inefficient watering and drought.

2.Rain protection slab;

- Required components: Rain sensor, 2 dc geared motors, 1293d IC,wooden shed, and protection paper.
- Rain protection slab protects our crop from heavy rainfall.
- It is the one type of the protection shield of crops.
- During rainfall, it protects the crop automatically.
- If excess sun radiation or temperature comes, it opens and protects our crop.
- Avoid CO2 problem like greenhouse.
- This system is operated automatically as well as manually.

3.Temperature & Humidity Control:

- Required components: LM-35, humidity sensor, etc.
- It measures and controls both humidity and temperature.

- In case temperature decreases, we can increase temperature by using heaters.

4.Moisture level of Soll;

- Using soil moisture sensor, we can check the moisturing level of soil at any time.
- By using soil moisture sensor, we can check the water level of crop.
- By chance, if the water level of crop is low, then the irrigation system will sprinkle up the water.

Arduino Program:

```
#include <LiquidCrystal.h>
// Define relay pins
#define RELAY1 10
#define RELAY2 11
#define RELAY3 12
#define RELAY4 13
// LCD setup: (RS, E, D4, D5, D6, D7)
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
// Sensor variables
unsigned int temp1, light, SM, Rain;
void setup() {
 lcd.begin(16, 2);
 pinMode(RELAY1, OUTPUT);
 pinMode(RELAY2, OUTPUT);
 pinMode(RELAY3, OUTPUT);
 pinMode(RELAY4, OUTPUT);
 // Optional: Turn all relays off initially
 digitalWrite(RELAY1, LOW);
 digitalWrite(RELAY2, LOW);
 digitalWrite(RELAY3, LOW);
 digitalWrite(RELAY4, LOW);
}
void loop() {
 ReadTemperature();
 ReadLightIntensity();
 ReadSoilMoisture();
 ReadRain();
 if (temp1 < 70) {
 digitalWrite(RELAY4, LOW);
```

```
 delay(10000);
 digitalWrite(RELAY1, LOW);
 digitalWrite(RELAY2, LOW);
 digitalWrite(RELAY3, LOW);
 delay(30000);
 digitalWrite(RELAY1, LOW);
 digitalWrite(RELAY2, HIGH);
 digitalWrite(RELAY3, LOW);
 digitalWrite(RELAY4, HIGH);
 delay(10000);
 } else {
 digitalWrite(RELAY1, LOW);
 digitalWrite(RELAY2, LOW);
 digitalWrite(RELAY3, LOW);
 digitalWrite(RELAY4, LOW);
 }
}
// -------------------------
// Functions to Read Sensors
// -------------------------
void ReadTemperature() {
 temp1 = analogRead(A0); // Assuming temperature sensor on A0
 temp1 = temp1 / 2.01; // Conversion factor (for LM35 type sensors)
 lcd.setCursor(0, 0);
 lcd.print("T=");
 lcd.print(temp1);
 lcd.write(byte(223)); // Degree symbol
 lcd.print("C ");
 delay(500);
}
void ReadLightIntensity() {
 light = analogRead(A1);
 light = light / 10.23;
 light = 100 - light;
 lcd.setCursor(8, 0);
 lcd.print("L:");
 lcd.print(light);
 lcd.print("% ");
 delay(500);
}
```

```
void ReadSoilMoisture() {
 SM = analogRead(A2);
 SM = SM / 10.23;
 SM = 100 - SM;
 lcd.setCursor(0, 1);
 lcd.print("SM:");
 lcd.print(SM);
 lcd.print("% ");
 delay(500);
}
void ReadRain() {
 Rain = analogRead(A3);
 Rain = Rain / 10.23;
 Rain = 100 - Rain;
 lcd.setCursor(8, 1);
 lcd.print("R:");
 lcd.print(Rain);
 lcd.print("% ");
 delay(500);
}
```

Applications:

- Useful for all type of crops. .
- Works like a protection shield to crop from heay rain & sun radations.
- We can control the temperature and humidity of crop.

Result:

- Using this system, we can increase the crop growth as well as farm output.
- Due to protection of excess rain and excess temperature, we reduce disease infection of crops.