SMART FARMER - IOT ENABLED SMART FARMING APPLICATION

TITLE	**SMART FARMER-IOT ENABLED SMART FARMING APPLICATION**
DOMAIN NAME	**INTERNET OF THINGS**
TEAM ID	**PNT2022TMID05399**
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1 INTRODUCTION

1.1 PROJECT OVERVIEW

The growth of the global population coupled with a decline in natural resources, farmland, and the increase in unpredictable environmental conditions leads to food security is becoming a major concern for all nations worldwide. These problems are motivators that are driving the agricultural industry to transition to smart agriculture with the application of the Internet of Things (IoT) and big data solutions to improve operational efficiency and productivity. This study presents a survey of IoT solutions and demonstrates how IoT can be integrated into the smart agriculture sector.

1.2 PURPOSE

IoT-based agriculture system helps the farmer in monitoring different parameters of the field like Soil moisture, Temperature and humidity using some sensors. Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers. They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the Mobile application itself.

2 LITERATURE SURVEY

2.1 EXISTING PROBLEM

- Agriculture is the strength of Indian Economy. However, for agriculture water consumption is more than rainfall every year.
- Farmers are usually involved in watering the crops at scheduled times which requires a lot of human intervention, they involve a high degree of guesswork and can be extremely wasteful.
- To overcome this, we can use precision farming methodologies. They can make the decision whether to water the crops or postpone it by monitoring the sensor parameters and controlling motor from mobile application itself.
- Automation of Watering crops reduces human intervention.

2.2 REFERENCES

- **TITLE OF THE PAPER :** Internet of Things (IoT) for Smart precision Agriculture and Farming in Rural Area, IEEE
  AUTHOR : Nurzaman Ahmed, Debashis De , Senior Member, IEEE, and Md. Iftekhar Hussain, Member, IEEE.
  METHOD : The authors have described that with the use of fog computing and WIFI-based long distance network in IoT, it is possible to connect the agriculture and farming bases situated in rural areas efficiently.

- **TITLE OF THE PAPER :** An Overview of Internet of Things (IoT) and Data Analytics in Agriculture.
  AUTHOR : Olakunle Elijah , Student Member, IEEE, Tharek Abdul Rahman, Member, IEEE, Igbafe Orikumhi, Member, IEEE, Chee Yen Leow, Member, IEEE And MHD Nour Hindia, Member, IEEE.
  METHOD : the authors have described several benefits and challenges of IoT have Been identified. They also presented the IoT ecosystem and how the combination of IoT and DA can be enabled in Smart Agriculture.

- **TITLE OF THE PAPER :** Internet of Things Monitoring System of modern Eco-agriculture Based on Cloud Computing,
  AUTHOR : Shubo Liu, Liqing Guo, Heather Web, Xiao Yao, Xiao Chang.
  METHOD : The authors have described an integrated framework system platform Incorporating IoT, Cloud Computing, Data Mining and other technologies and Proposed a new model for its application in the field of modern agriculture.

- **TITLE OF THE PAPER :** Smart Agriculture using IOT.
  AUTHOR : Sweksha Goyal, Unnathi Mudra, Prof Sahana Shetty.
  METHOD : The authors have aimed in making a technology which is completely automated. The methodology used in this system can monitor the humidity, moisture Level and can even detect motions

- **TITLE OF THE PAPER :** IoT based Smart Agriculture, International Journal of Science, Engineering and Technology Research (IJSETR)
  AUTHOR : Sidhanth Kamath B, Kiran K Kharvi , Mr. Abhir Bhandary, Mr.Jason Elroy Martis.
  METHOD : The authors have suggested a low cost IoT enabled smart agricultural System which can evaluate the farmland and predict which type of crop is best for that land based on the data collected from local conditions of that land varying from humidity to soil moisture content.

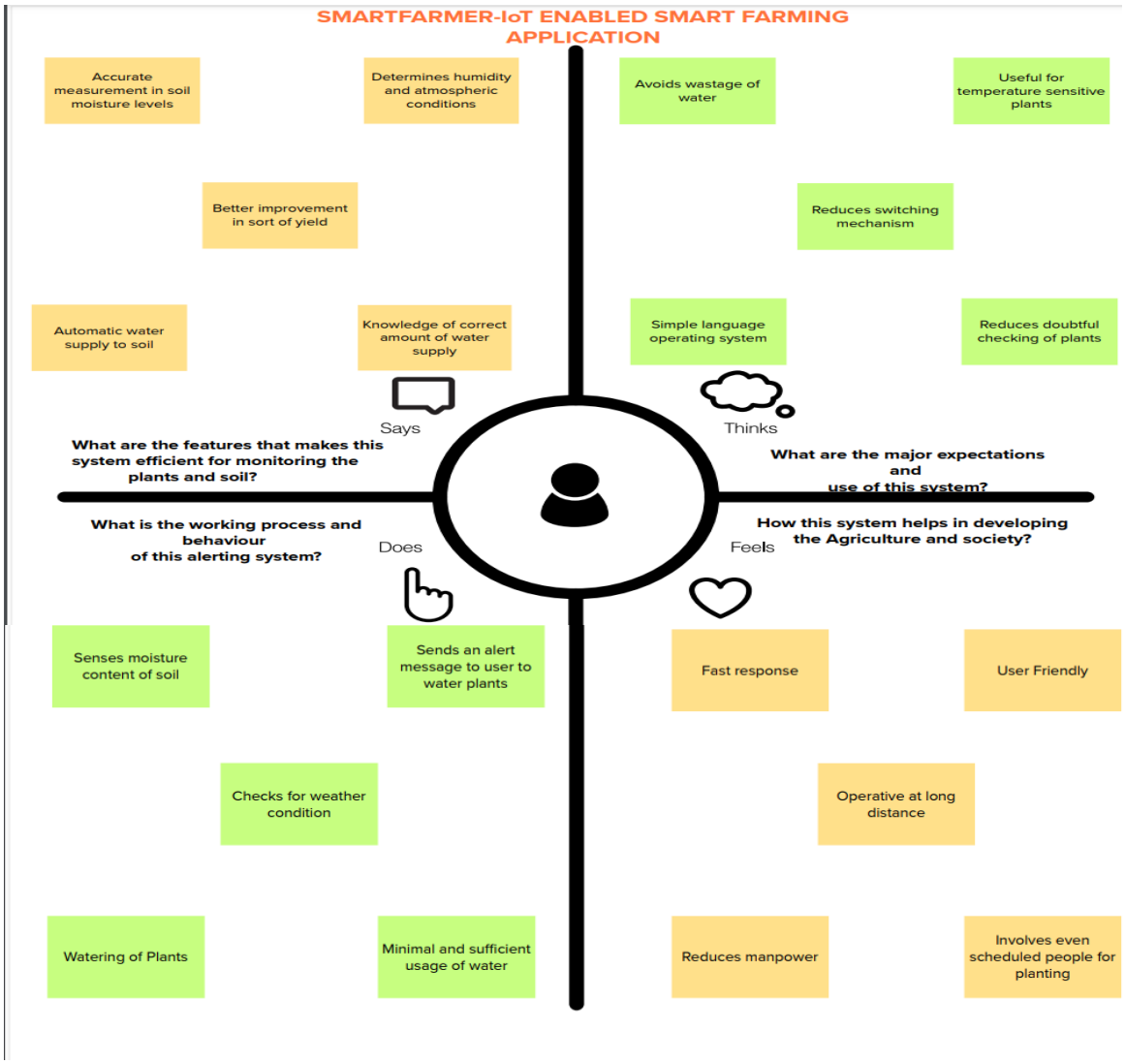
- **TITLE OF THE PAPER :** IOT Based On Smart Agriculture.
  AUTHOR : Mr.N.Sivakumar, Mr.P.Thiyagarajan, Ms.R.Sandhiya,
  METHOD : The authors have proposed a sensor system which monitors and Maintains the desired soil moisture content via automatic power supply.

2.3 PROBLEM STATEMENT DEFINITIONS

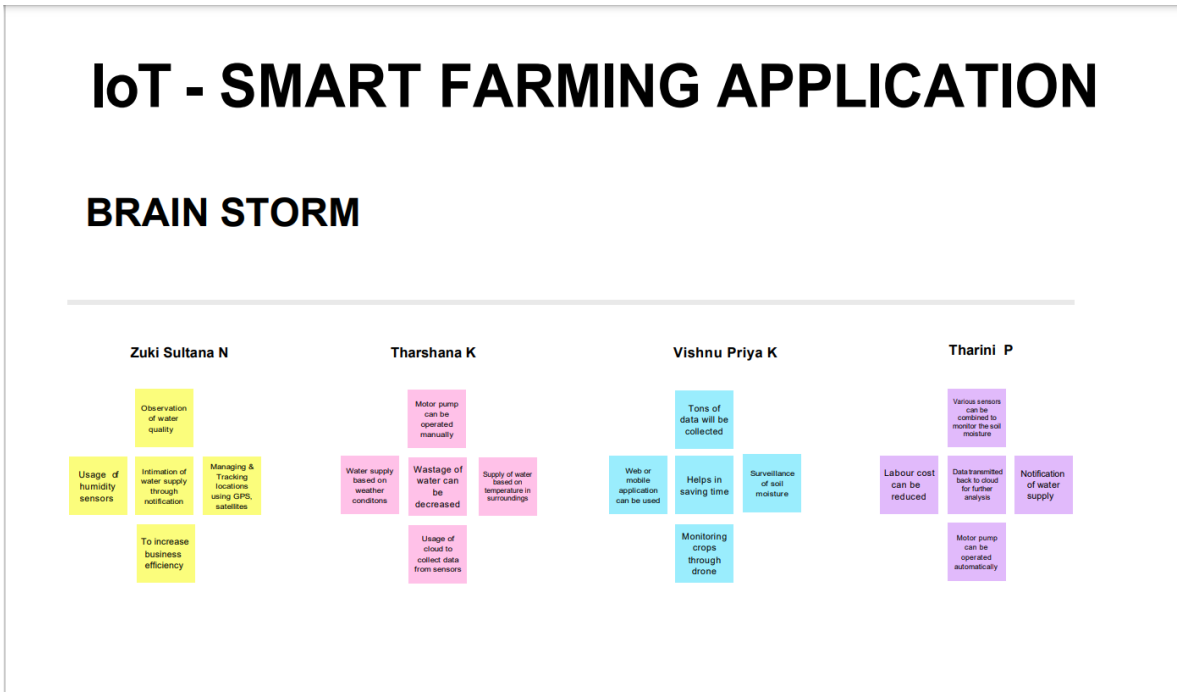
To provide efficient decision support system using wireless sensor network which handle Different activities of farm and gives useful information related to farm. Information related To Soil Moisture, Temperature and Humidity Content. Due to the weather condition, water Level increasing get lot of distractions which is not good for Agriculture. Water level is Managed by farmers in both Automatic/Manual using that mobile application. It will make Comfortable to farmers.

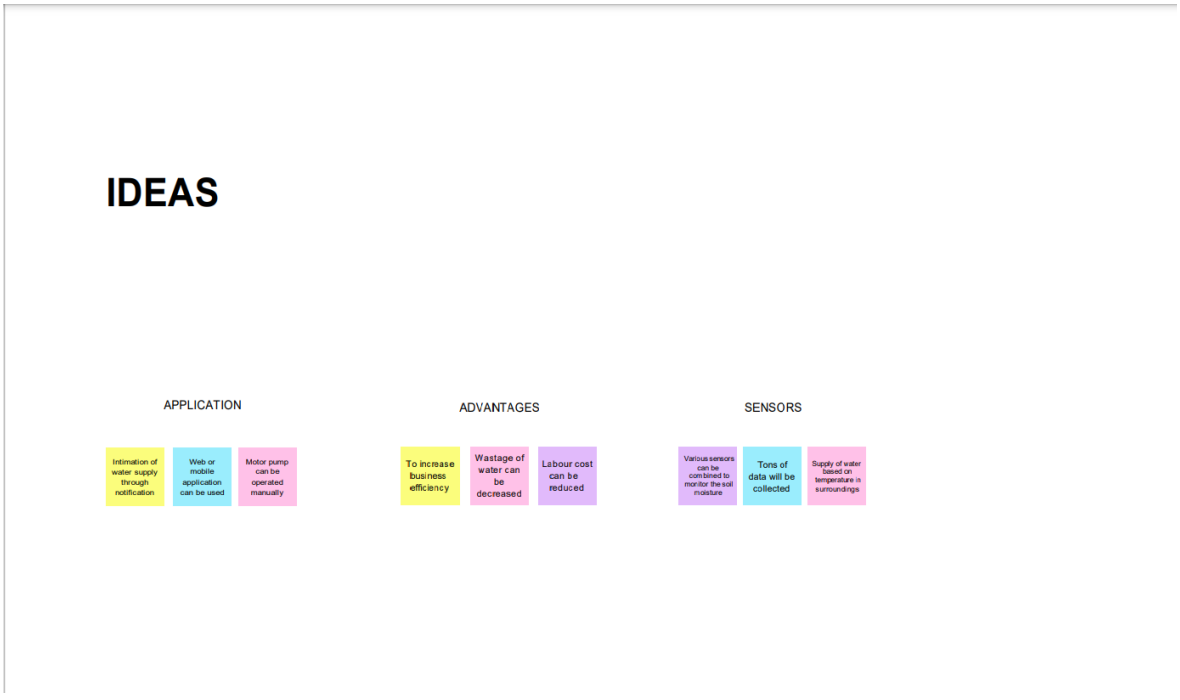
3 IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING

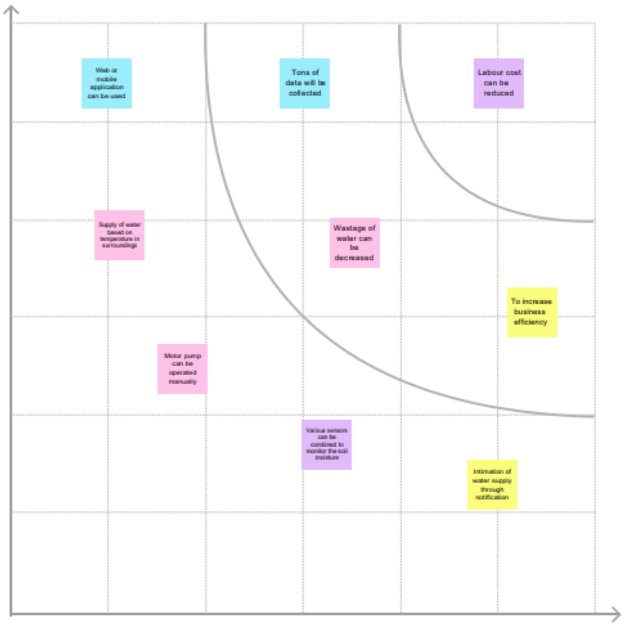




PRIORITIZE

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?



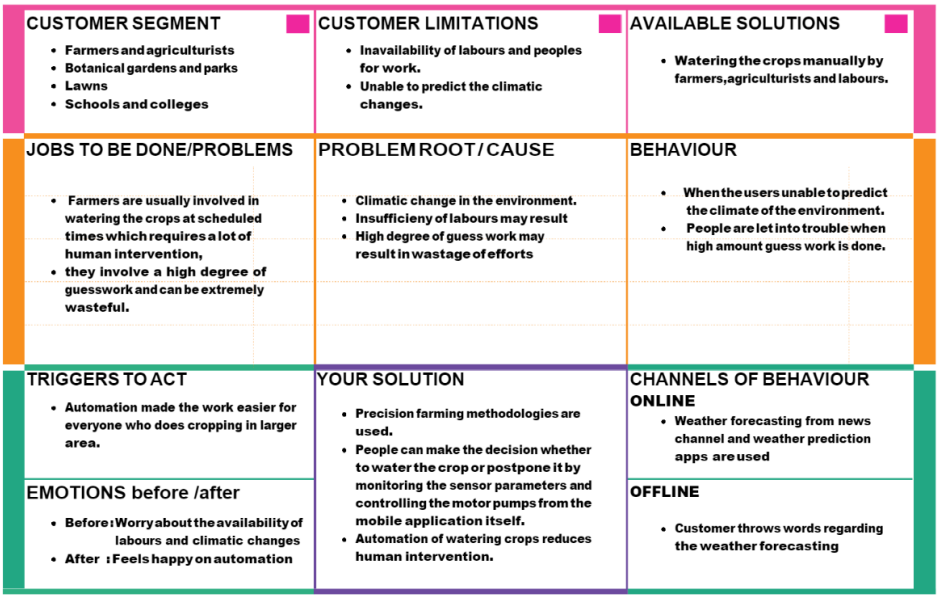
Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	India is a Global agricultural powerhouse which is considered as the key for Human Progress. Farmers are usually involved in watering the crops at scheduled times which requires a lot of human intervention, they involve a high degree of guesswork and can be extremely wasteful.
2.	Idea / Solution description	We can use precision farming methodologies. They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself. Automation of watering crops reduces human intervention.
3.	Novelty / Uniqueness	Smart agriculture farming system is a new idea of farming in agriculture, because which uses IOT technology to monitor the crop 24/7 and sends the information to the cloud. This emerging system increases the quality and quantity of agricultural products. IOT technology provides the information about farming fields and then takes action depending on the farmer input.
4.	Social Impact / Customer Satisfaction	Weather forecasts and sensors that measure soil moisture mean watering only when necessary and for the right length of time.
5.	Business Model (Revenue Model)	IOT in business can instruct systems to autonomously execute transactions in supply chains when certain conditions have been met. Increase productivity and reliability in real time environment
6.	Scalability of the Solution	The ability to increase available resources and system capability without the need to go through a major system redesign or implementation.

3.4 PROBLEM SOLUTION FIT



4 REQUIREMENT ANALYSIS

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through Linked In
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Profile	Log in Access the Profile
FR-4	Analyse	Data from smart sensors can be analyzed for predictive analysis and automated decision-making.
FR-5	Recommend	Based on the farming the software recommends the automated irrigation practices.

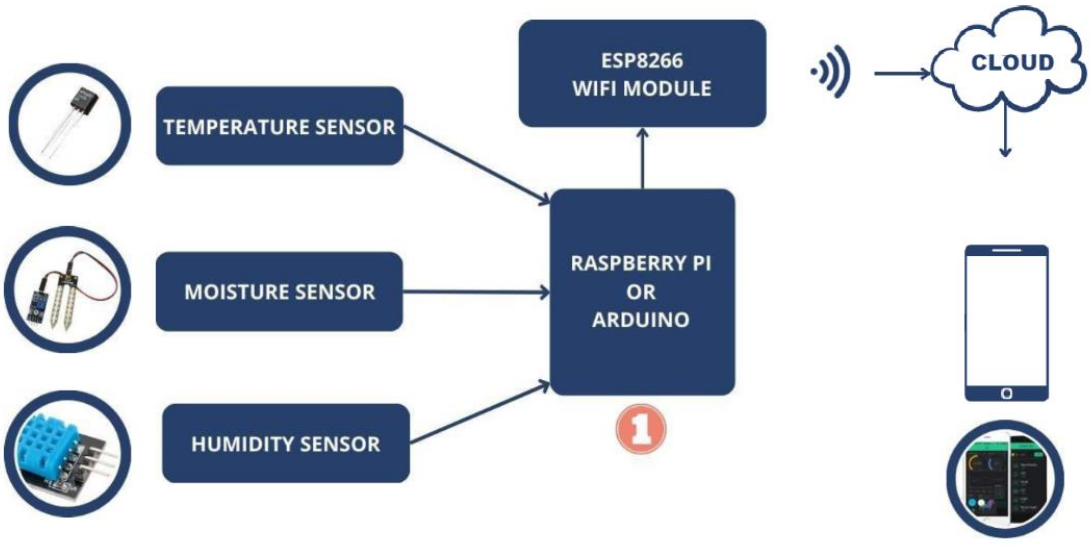
Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

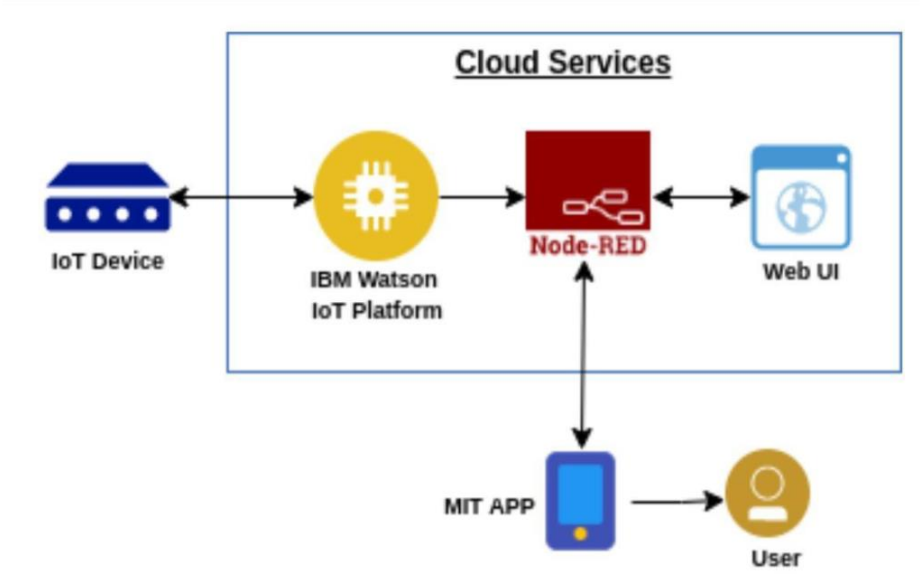
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	End users can monitor and control their connected farm using IOT applications on their smartphones or tablets.
NFR-2	Security	The software keeps the user's information more securely.
NFR-3	Reliability	The smart farm, embedded with IOT systems, could be called a connected farm, which can support a wide range of devices from diverse agricultural device manufactures.
NFR-4	Performance	It is a user-friendly software and have high performance.
NFR-5	Availability	Available for every user, visible for all users and farmer.
NFR-6	Scalability	The proposed precision farming structure allows the implementation of a flexible methodology that can be adopted to different types of crops.

5 PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS



5.2 SOLUTION AND TECHNICAL ARCHITECTURE



5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through G-mail	I can receive confirmation email & click confirm to login	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password		High	Sprint-1
User Type	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**

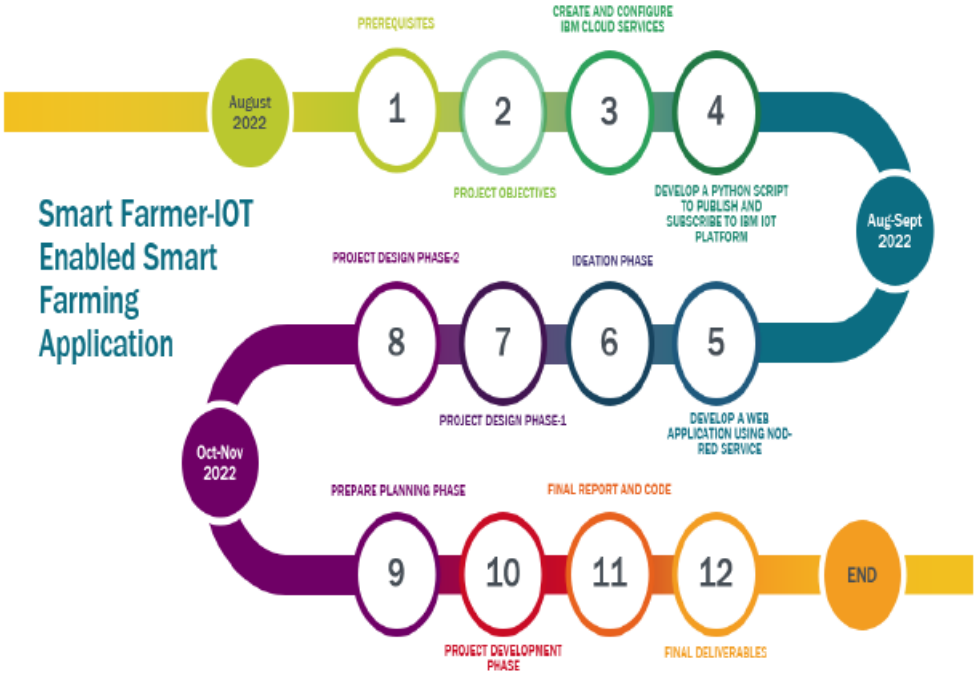
		USN-5	If I forgot my password or username, I can reset it again through my email	I can receive reset Mail to the registered Email Id	High	Sprint-2
Customer (Web user)	Registration	USN-6	As a user, I can register by entering my email, password, and confirming my password	I can access my account / dashboard	High	Sprint-2
		USN-7	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-2
		USN-8	As a user, I can register for the application through G-mail	I can receive confirmation email & click confirm to login	Medium	Sprint-2
	Login	USN-9	As a user, I can log into the application by entering email & password		High	Sprint-2
		USN-10	If I forgot my password or username, I can reset it again through my email	I can receive reset Mail to the registered Email Id	High	Sprint-3

User Type	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**
Customer Care Executive	Help	USN-11	If I have any doubt in using application or web, I can clarify it by clicking Help option in the dashboard.		High	Sprint-3
Administrator	Feedback	USN-12	I Can give my feedback about the application and I can post my queries.	I can receive acknowledgement	Low	Sprinit-4

6 PROJECT PLANNING & SCHEDULING

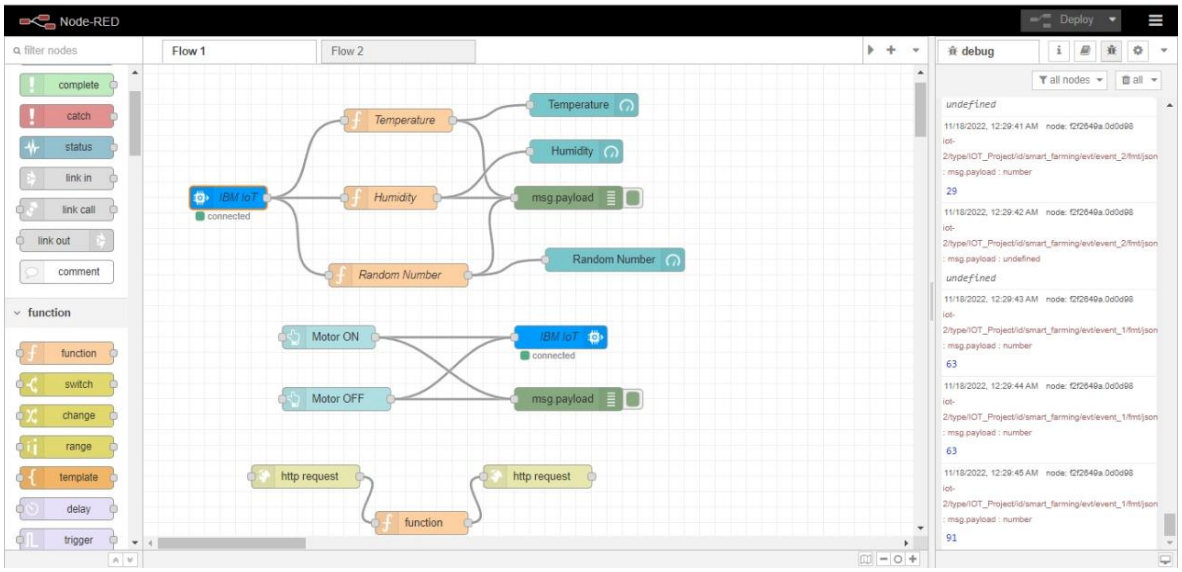
6.1 SPRINT PLANNING

6.2 PREPARE MILESTONE AND ACTIVITY LIST

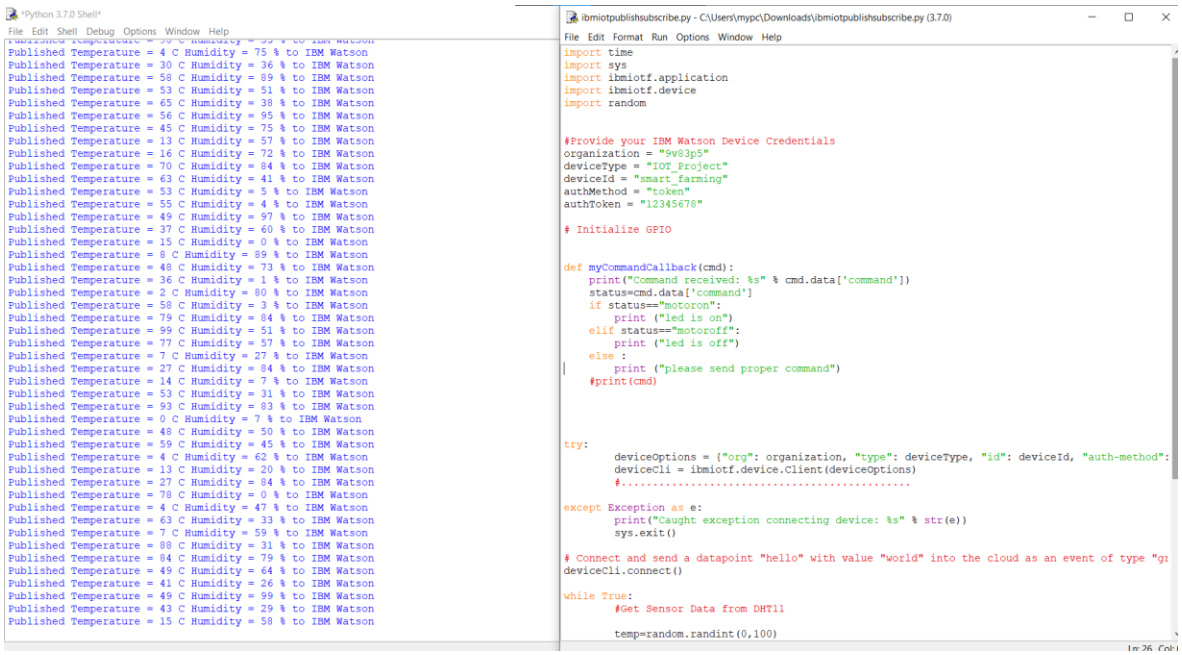


7 CODING AND SOLUTIONING

7.1 SEND GRID



7.2 DATABASE SCHEMA



CODE

```
// Include Libraries
#include "Arduino.h"
#include "DHT.h"
#include "SoilMoisture.h"
#include "SolenoidValve.h"


// Pin Definitions
#define DHT_PIN_DATA    2
#define SOILMOISTURE_5V_PIN_SIG         A3
#define SOLENOIDVALVE_PIN_COIL1         3



// Global variables and defines

// object initialization
DHT dht(DHT_PIN_DATA);
SoilMoisture soilMoisture_5v(SOILMOISTURE_5V_PIN_SIG);
SolenoidValve solenoidValve(SOLENOIDVALVE_PIN_COIL1);


// define vars for testing menu
const int timeout = 10000;       //define timeout of 10 sec
char menuOption = 0;
long time0;

// Setup the essentials for your circuit to work. It runs first every time your circuit is
powered with electricity.
void setup()
{
  // Setup Serial which is useful for debugging
  // Use the Serial Monitor to view printed messages
  Serial.begin(9600);
  while (!Serial) ; // wait for serial port to connect. Needed for native USB
  Serial.println("start");

  dht.begin();
  menuOption = menu();

}

// Main logic of your circuit. It defines the interaction between the components you
```

selected. After setup, it runs over and over again, in an eternal loop.

```
void loop()
{


  if(menuOption == '1') {
  // DHT22/11 Humidity and Temperature Sensor - Test Code
  // Reading humidity in %
  float dhtHumidity = dht.readHumidity();
  // Read temperature in Celsius, for Fahrenheit use .readTempF()
  float dhtTempC = dht.readTempC();
  Serial.print(F("Humidity: ")); Serial.print(dhtHumidity); Serial.print(F(" [%]\t"));
  Serial.print(F("Temp: ")); Serial.print(dhtTempC); Serial.println(F(" [C]"));

  }
  else if(menuOption == '2') {
  // Soil Moisture Sensor - Test Code
  int soilMoisture_5vVal = soilMoisture_5v.read();
  Serial.print(F("Val: ")); Serial.println(soilMoisture_5vVal);

  }
  else if(menuOption == '3') {
  // 12V Solenoid Valve - 3/4'' - Test Code
  // The solenoid valve will turn on and off for 500ms (0.5 sec)
  solenoidValve.on(); // 1. turns on
  delay(500);      // 2. waits 500 milliseconds (0.5 sec). Change the value in the brackets
(500) for a longer or shorter delay in milliseconds.
  solenoidValve.off();// 3. turns off
  delay(500);      // 4. waits 500 milliseconds (0.5 sec). Change the value in the brackets
(500) for a longer or shorter delay in milliseconds.

  }

  if (millis() - time0 > timeout)
  {
    menuOption = menu();
  }

}



// Menu function for selecting the components to be tested
// Follow serial monitor for instructions
char menu()
{
```

```
        Serial.println(F("\nWhich component would you like to test?"));
        Serial.println(F("(1) DHT22/11 Humidity and Temperature Sensor"));
        Serial.println(F("(2) Soil Moisture Sensor"));
        Serial.println(F("(3) 12V Solenoid Valve - 3/4'"));
        Serial.println(F("(menu) send anything else or press on board reset button\n"));
        while (!Serial.available());

        // Read data from serial monitor if received
        while (Serial.available())
        {
          char c = Serial.read();
          if (isAlphaNumeric(c))
          {

            if(c == '1')
                        Serial.println(F("Now Testing DHT22/11 Humidity and
    Temperature Sensor"));
                else if(c == '2')
                        Serial.println(F("Now Testing Soil Moisture Sensor"));
                else if(c == '3')
                        Serial.println(F("Now Testing 12V Solenoid Valve - 3/4'"));
            else
            {
              Serial.println(F("illegal input!"));
              return 0;
            }
            time0 = millis();
            return c;
          }
        }
}
```

8.RESULTS

Circuit Link

https://www.circuito.io/static/reply/index.html?solutionId=6377249a9c640b00305e38b0&solutionPath=storage.circuito.io

Demo Video Link

https://drive.google.com/file/d/1y6PqKhFlylKYGOWJavbLTvsYQu0S4wf4/view?usp=drivesdk

Github Link

https://github.com/IBM-EPBL/IBM-Project-8188-1658910984

9 ADVANTAGES AND DISADVANTAGES

ADVANTAGES

One of the really good things about this branch of farming is that it allows for Soil Sensing. This aspect of smart farming gives room for you as a farmer to test your soil for information and also measure it for a wide range of important and nutritious constituents necessary in securing the good health of your farm produce. Soil sensing is also employed to appropriately control the application of real-time variable rate equipment. This allows you to understand the scale of your grounds, making you also, in this process, device effective ways of conserving necessary farming resources like water, fertilizer and so on. So, with this, you only have to apply fertilizers and pesticides where you need to apply them so as not to negatively affect your plants. You also get to conserve seeds, fertilizer, water, etc., and still even maximize yields at the end of the day.

DISADVANTAGES

One huge disadvantage of smart farming is that it requires an unlimited or continuous internet connection to be successful. This means that in rural communities, especially in the developing countries where we have mass crop production, it is completely impossible to operate this farming method. In places where internet connections are frustratingly slow, smart farming will be an impossibility. As pointed out earlier, smart farming makes use of high techs that require technical skill and precision to make it a success. It requires an understanding of robotics and ICT. However, many farmers do not have these skills. Even finding someone with this technical ability is difficult or even expensive to come by, at most. And, this can be a discouraging factor hindering a lot of promising farmers from adopting it.

10 CONCLUSION

So after knowing about some IoT applications in agriculture, we can say that it is definitely revolutionize the agriculture industry in a few years. IoT has been applied in several areas of agriculture. A lot of research is underway to ensure more IoT devices are used to make the managing of farms easier and increase productivity. IoT is allowing farmers to easily obtain data that is useful in many ways such as decision making. With the increasing demand for food due to the rapid population increase, we expect more IoT applications in the next few years.The system uses information from soil moisture sensors to irrigate the soil to avoid the damage of crops due to over irrigation or under irrigation. The project provided us with an opportunity to study the existing systems, along with their features and drawbacks. Future work includes the usage of the application in the native languages. Also giving notifications in native audio format to assist the farmers.

11 FUTURE SCOPE

In the future, this smart farming revolution depicts, pesticide and fertilizer use will drop while overall efficiency will rise. IoT technologies will enable better food traceability, which in turn will lead to increased food safety. It will also be beneficial for the environment, through, for example, more efficient use of water, or optimization of treatments and inputs. Therefore, smart farming has a real potential to deliver a more productive and sustainable form of agricultural production, based on a more precise and resource-efficient approach. New farms will finally realize the eternal dream of mankind. It'll feed our population, which may explode to 9.6 billion by 2050.