A

Project Report

on

Solution of Farmers Problems using Sensors

Submitted by

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CERTIFICATE

This is to certify that the project titled "**Solution of Farmers Problems using Sensors**" is a record of the bonafide work done Sanskar Bansal (229209036) and Vikas Choudhary (229209030) submitted in partial fulfilment of the requirements for the completion of the project-based learning course in Bachelor of Technology (B. Tech) in **Electrical and Computer Engineering** at Manipal University Jaipur, during the academic year 2023- 24.

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Chapter 1- INTRODUCTION

In today's rapidly evolving world, the intersection of technology and agriculture holds immense promise for addressing the complex challenges faced by farmers worldwide. Our project represents a pioneering effort to harness the power of sensor technologies to revolutionize farming practices, particularly in the context of smallholder agriculture. By integrating soil moisture sensors and LM35 temperature sensors into a unified system, we aim to provide farmers with real-time insights into crucial environmental factors, empowering them to make informed decisions and optimize agricultural productivity.

With the global population steadily rising and climate change posing increasingly unpredictable weather patterns, the need for innovative solutions in agriculture has never been more urgent. Smallholder farmers, who constitute a significant portion of the global agricultural workforce, are particularly vulnerable to these challenges. Limited access to resources, technical knowledge, and infrastructure often exacerbates their struggles, making it imperative to develop accessible and affordable technologies tailored to their needs.

Through our project, we seek to address these challenges head-on by leveraging sensor technologies to democratize access to vital agricultural information. By providing smallholder farmers with real-time data on soil moisture levels and temperature conditions, we aim to equip them with the tools needed to optimize irrigation, enhance crop management, and mitigate the risks associated with climate variability. By bridging the gap between traditional farming methods and modern technology, our project endeavors to empower farmers to thrive in an ever-changing agricultural landscape.

Chapter 2- BACKGROUND THEORY

- **Modern Agricultural Challenges**: Agriculture faces contemporary hurdles like climate change, population growth, and resource scarcity. These factors directly impact farmers' ability to sustainably produce food and generate income.

- **Plight of Smallholder Farmers**: Smallholder farmers, a vital part of the agricultural sector, often lack access to crucial resources and face financial constraints. Their limited capacity to adopt modern farming techniques hampers their ability to cope with these challenges effectively.

- **Inefficiencies of Traditional Methods**: While traditional farming practices have historical significance, they struggle to adapt to modern demands. Inadequate irrigation practices and suboptimal resource management lead to reduced crop yields and lower revenue for farmers.

- **Emergence of Sensor Technologies**: Sensor technologies offer a promising solution to these challenges by providing real-time data on crucial agricultural parameters. Soil moisture sensors and LM35 temperature sensors enable farmers to make data-driven decisions, optimizing irrigation, managing soil health, and enhancing crop quality.

- **Impact on Revenue**: Implementing sensor technologies not only improves agricultural productivity but also directly impacts farmers' revenue. By optimizing irrigation practices and reducing water wastage, farmers can lower input costs and increase crop yields, ultimately leading to higher profits.

- **Holistic Approach to Agricultural Resilience**: Our project adopts a holistic approach by integrating soil moisture sensors and LM35 temperature sensors into a unified system. This comprehensive solution empowers farmers to make informed decisions that enhance productivity, conserve resources, and maximize revenue, ensuring long-term resilience and prosperity in agriculture.

Chapter 3- METHODOLOGY

3.1 Objective of the work

- How to achieve maximum production
- Part time jobs along with farming
- Accurate prediction about weather and moisture quantity in soil
- Reduce manual power and save time.

3.2 Methodology

Problem Identification:

- Recognized the need to address challenges faced by farmers related to insufficient real-time monitoring of temperature and soil moisture levels in agricultural settings.
- Acknowledged the impact of inadequate monitoring on farmers' decision-making processes, crop yields, and overall agricultural productivity.

Component Selection:

- Conducted research to identify suitable sensors for temperature and soil moisture monitoring.
- Selected the LM35 temperature sensor and YL-69 soil moisture sensor based on their accuracy, reliability, and compatibility with the Arduino platform.
- Considered factors such as cost-effectiveness and ease of integration into the project design.

Circuit Design:

- Developed a comprehensive circuit layout to facilitate the integration of the selected sensors, Arduino board, and Liquid Crystal Display (LCD).
- Carefully planned the arrangement of components to ensure efficient data flow and minimize interference.
- Implemented appropriate wiring connections and utilized standard protocols to interface the sensors with the Arduino board and LCD display.

Programming:

- ●● Created Arduino code to establish communication with the LM35 temperature sensor and YL-69 soil moisture sensor.
- ●● Implemented algorithms to read analog data from the sensors and convert it into meaningful temperature and moisture percentage values.
- ●● Developed logic to display the acquired data on the LCD screen in a clear and user-friendly format.
- ●● Incorporated error handling mechanisms to address potential issues such as sensor malfunctions or data inaccuracies.

Testing and Calibration:

- ●● Conducted rigorous testing to validate the accuracy and reliability of the sensor readings.
- ●● Utilized calibration techniques to fine-tune sensor outputs and ensure alignment with expected values.
- ●● Employed simulated environmental conditions to assess the system's performance under varying temperature and moisture levels.
- ●● Iteratively refined the system based on testing feedback to optimize functionality and enhance overall performance.

Integration:

- ●● Integrated all hardware and software components into a cohesive system architecture.
- ●● Verified proper functionality and compatibility of individual components within the system framework.
- ●● Implemented robust data handling mechanisms to ensure seamless communication between sensors, Arduino board, and LCD display.
- ●● Conducted thorough integration testing to identify and address any compatibility issues or system inconsistencies.

Documentation:

- ●● Documented the entire project methodology, including detailed circuit diagrams, code explanations, and testing procedures.
- ●● Compiled comprehensive documentation to facilitate replication of the project by other stakeholders.
- ●● Emphasized the importance of clear and concise documentation for troubleshooting purposes and knowledge transfer.
- ●● Organized project documentation in a structured format to enhance accessibility and usability for future reference.

Conclusion:

- Summarized the methodology section, emphasizing the systematic approach followed to implement the project.
- Highlighted the critical steps involved in sensor selection, circuit design, programming, testing, integration, and documentation.
- Reaffirmed the significance of the methodology in addressing real-world agricultural challenges and enabling informed decision-making for farmers.

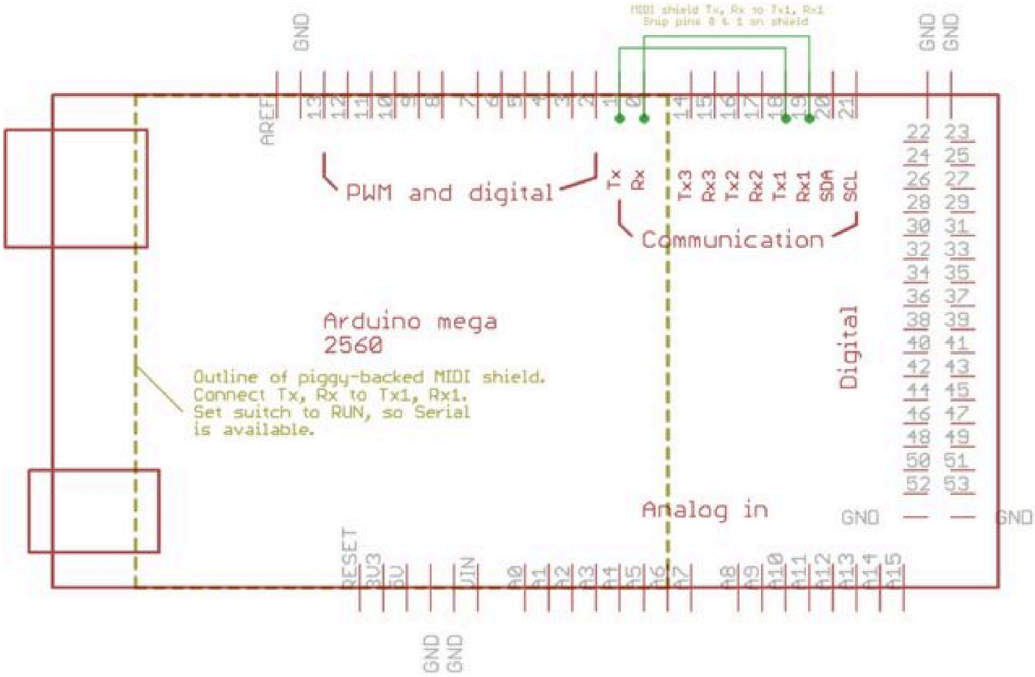
CHAPTER 4- Code and Equipments

4.1 Code

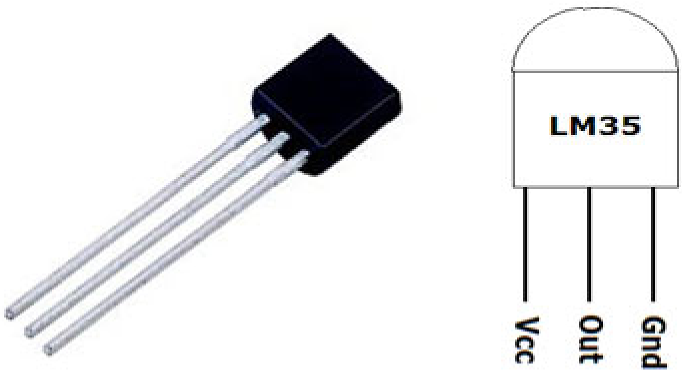
```
#include <LiquidCrystal.h>

#define tempSensor A1     // Analog pin connected to the LM35 temperature sensor
#define moistureSensor A0 // Analog pin connected to the YL-69 sensor

const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2, ct = 9; // Pins connected to the LCD
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);              // Initialize LCD

void setup() {
  Serial.begin(9600);
  lcd.begin(16, 2);  // Initialize the LCD with 16 columns and 2 rows
  lcd.print("Hi:  T&M:");
}

void loop() {
  int tempValue = analogRead(tempSensor);        // Read temperature value from the LM35 sensor
  int moistureValue = analogRead(moistureSensor); // Read moisture value from the YL-69 sensor

  // Convert analog reading to temperature in Celsius
  float temperatureC = (tempValue * 5.0 / 1024.0) * 100.0;

  // Convert analog reading to moisture percentage (0-100%)
  int moisturePercentage = map(moistureValue, 0, 1023, 100, 0);

  lcd.clear(); // Clear the LCD screen

  // Display temperature and moisture on LCD
  lcd.setCursor(0, 0); // Set cursor to first row
  lcd.print("Hi ");
  lcd.print("Vishnu ");
  lcd.print("Sir");

  lcd.setCursor(0, 1); // Set cursor to second row
  lcd.print("T&M ");
  lcd.print(temperatureC);
  lcd.print("C ");
  lcd.print(moisturePercentage);
  lcd.print("%");

  // Print temperature and moisture to serial monitor
  Serial.print("Hi ");
  Serial.print("Vishnu ");
  Serial.println("Sir");
  Serial.print("T&M ");
  Serial.print(temperatureC);
  Serial.print("C ");
  Serial.print(moisturePercentage);
  Serial.println("%");
  delay(1000); // Delay before taking next reading
}
```

4.2 Equipments Used

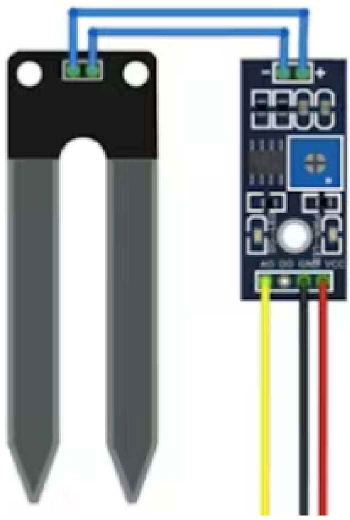
1. **Arduino :**



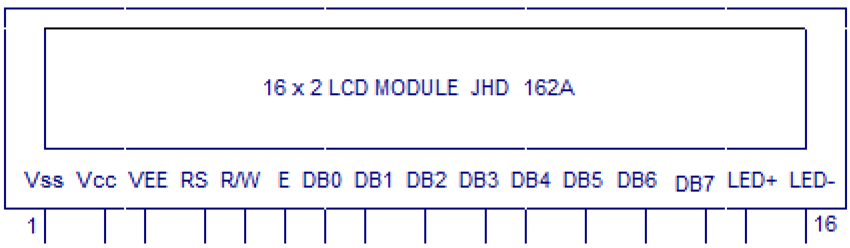
2. **LM-35 :**



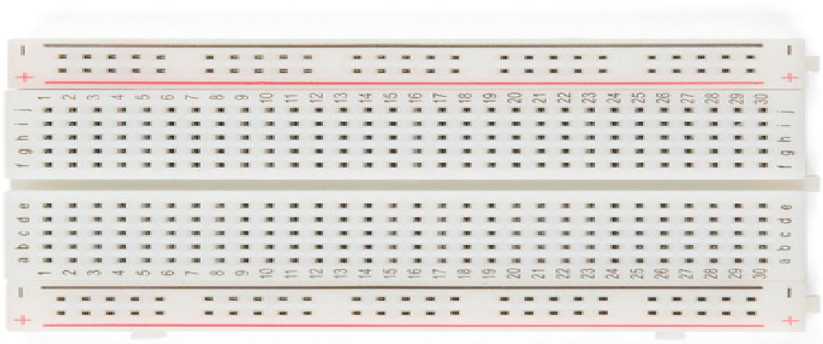
3. **Soil Moisture Sensor YL-69 :**



4. **LCD JHD 162A :**



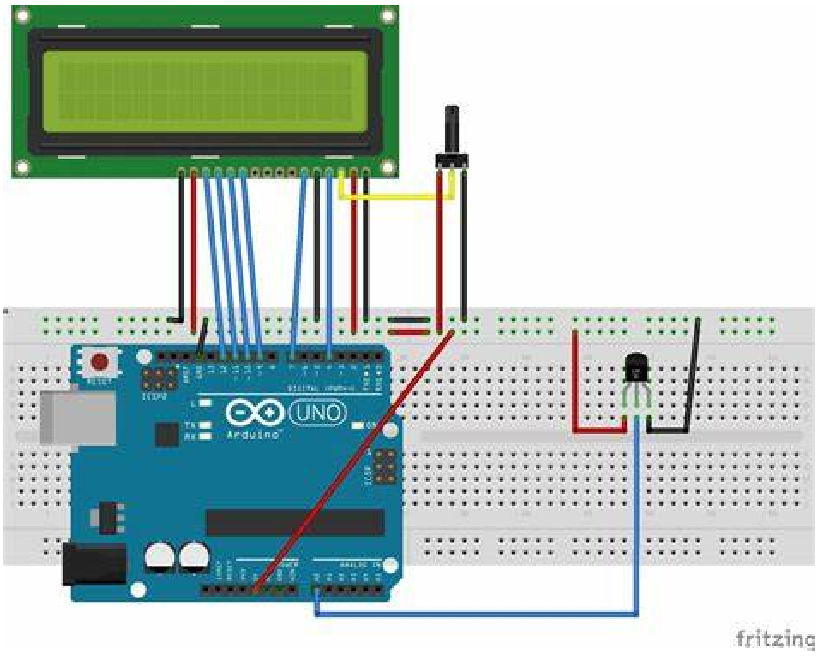
5. **Breadboard :**



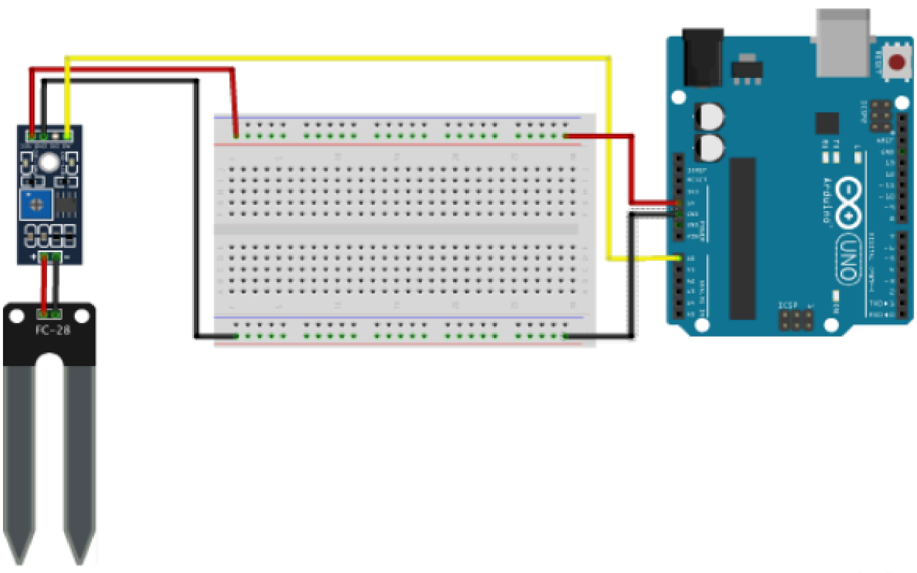
6. Wires :

Chapter 5 -Circuit Diagram

Connection of LM35 and LCD through Arduino:



Connection of YL69 through Arduino :



CHAPTER 5- Conclusion

In conclusion, our project represents a significant step forward in addressing critical challenges faced by farmers through the integration of sensor technologies. By developing a real-time monitoring system for temperature and soil moisture levels, we have empowered farmers with valuable insights to make informed decisions and optimize agricultural practices.

Through our work, we have not only enhanced decision-making capabilities but also contributed to the overall goal of improving agricultural productivity and sustainability. By optimizing resource allocation and promoting soil health, we have laid the foundation for increased crop yields and long-term resilience in farming communities.

Furthermore, our project underscores the importance of technology in democratizing access to essential agricultural tools, particularly for smallholder farmers. By providing affordable and accessible solutions, we have empowered farmers to overcome barriers and thrive in an increasingly complex agricultural landscape.

Looking ahead, the impact of our project extends beyond the confines of this study. It serves as a testament to the transformative potential of sensor technologies in agriculture and paves the way for future innovations and advancements in the field. Through continued collaboration and innovation, we can build upon this foundation to further enhance agricultural productivity, sustainability, and resilience for generations to come.

References

[1] https://docs.arduino.cc/resources/datasheets/A000067-datasheet.pdf

[2] https://youtube.com/playlist?list=PLV3C-t_tgjGFyXP_-AF37AoIuxM9jzELM&feature=shared

[3] Interfacing 16x2 LCD with Arduino Uno | 16x2 LCD Arduino I2C