SOIL MONITORING SYSTEM

A course project report submitted in partial fulfillment of the requirement of

DESIGN FOR SOCIAL IMPACT-II

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<u>CERTIFICATE</u>

This is to certify that the project entitled “Soil Monitoring system” is the bonafied work carried out by **R.Srija(2003A51028), G.Sai Sanjana (2003A51121), P.Sathwika(2003A51135), Ch.SuryaReddy(2005A41108), A.AkhilTeja(2005A41119**) as a Design for social Impact –I project for the partial fulfillment to award the degree **BACHELOR OF TECHNOLOGY** during the academic year 2022-2023 at SR University, under our guidance and Supervision.

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INDEX

CHAPTER NO.	TITLE OF THE CHAPTER	PAGE NO.
I.	INTRODUCTION	1
II.	PRODUCT ARCHITECTURE AND DETAILED DESIGN	6
III.	FAILURE MODE ANALYSIS	12
IV.	USER INTERACTION, FEEDBACK AND FIELD TESTING	13
V.	USER MANUAL	14
VI.	CONCLUSION	15
VII.	APPENDIX	16

CHAPTER I

INTRODUCTION

1. COMMUNITY AND PROBLEM STATEMENT:

Community: Agriculture

Agriculture is the community that has been chosen for our project. In order to do this, we have partnered with the farmers and labor and inquired about their working conditions and any difficulties they may encounter.

The agriculture community plays a vital role in ensuring food security and providing economic opportunities in many regions of the world. They work to cultivate crops, raise livestock, and manage natural resources in a sustainable manner. They also contribute to the development of new technologies and techniques that can improve agricultural productivity and profitability.

Agriculture is the practice of growing crops and raising animals for food, fuel, and other products. It is among the earliest human endeavors and crucial to the continued existence of our species.

Agricultural practice's can vary greatly based on elements like climate, soil type, and resource availability. Although large-scale, industrialized modern agriculture is dependent on cutting-edge technology, there is growing interest in more sustainable and regenerative farming practices.

Problem Statement:

Overuse of inorganic fertilizers has been identified as a problem in agriculture.

CHAPTER II

PRODUCT ARCHITECTURE AND DETAILED DESIGN

DESIGN ARCHITECTURE:

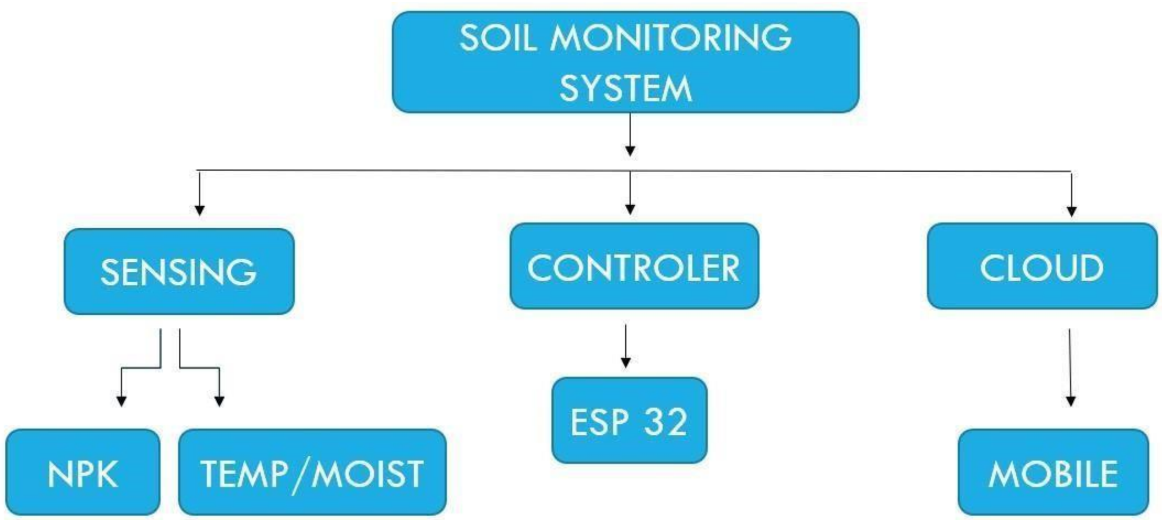

Fig.2.1 Design architecture of our product

The above fig describes about iur design which gives the overall idea for our design i.e what are the components we have used in it and how it works according the connections etc. we have used NPK, Temperature and soil moisture sensors to monitor these values of the soil .And we have used ESP 32 a powerful microcontroller that can be used in soil monitoring systems to collect data from various sensors and transmit it wirelessly to a central location. The role of the ESP32 in a soil monitoring system depends on the specific application.And it pass values to the mobile using cloud application status .And the final readings of NPK<temp and moisture will be displayed on the mobile application.

BUDGET:

S.No	Name of the Component	Amount
1	NPK sensor	3000
2	Temperature sensor	100
3	Esp 32	1000
4	connecting Wires	100
5	Power supply	100
6	Bread board	250
7	Soil moisture sensor	800 Total: 5350Rs

Fig.2.2 Budget planning of our project

The above figure descibes the budjet planning of all the components involved in our project design .the NPK sensor costs 3000.and the temperature sensor costs 100 per unit.Esp 32 micro controller costs 1000 whereas all other connecting wires cost 100.The power supply which we have used costs 100 ,Beardboard for connecting the sensors costs 250 and finally the soil moistures sensor costs 800.the overall budjet is around 5350Rs.

2.1.MIND MAPPING:

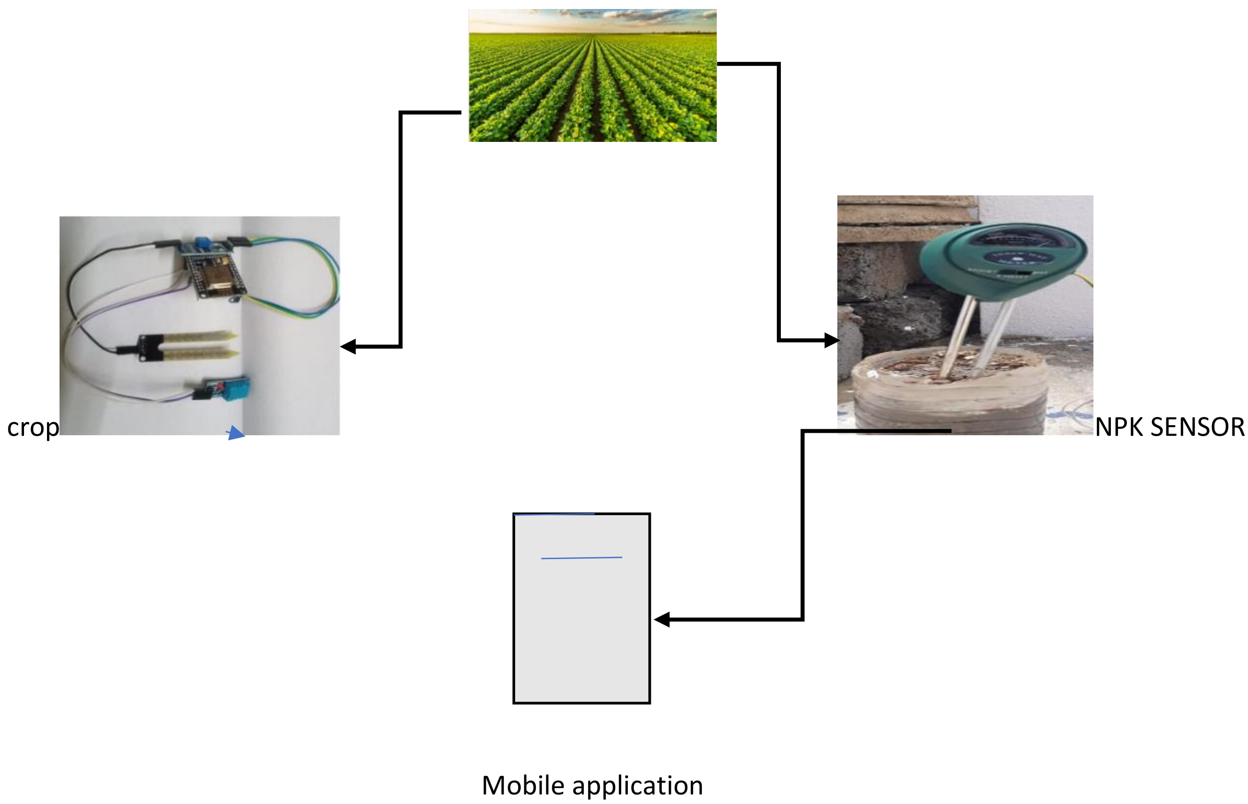

Fig.2.2.1 Mind mapping of our design

○ This design is based on reducing the effects of inorganic fertilizer overuse on the soil. ○ We offer a test of NPK in order to use the correct percentage of fertilizers. ○ We are developing a monitoring system to provide to test accurate fertilize level of soil. ○ We used NPK sensors, a moisture sensor, and an ESP 32 controller for this. ○ After testing the soil, the accurate percentage of NPK and moisture of the soil is texted and sent via cloud to the farmer's mobile

2.2 DESCRIPTION OF THE DESIGN:

a. Mechanical design:

○ This design is based on reducing the effects of inorganic fertilizer overuse on the soil. ○ We offer a test of NPK in order to use the correct percentage of fertilizers. ○ We are developing a monitoring system to provide to test accurate fertilize level of soil. ○ We used NPK sensors, a moisture sensor, and an ESP 32 controller for this. ○ After testing the soil, the accurate percentage of NPK and moisture of the soil is texted and sent via cloud to the farmer's mobile

b.components:

NPK SENSOR:

An NPK moisture sensor is a type of soil nutrient sensor that measures the concentration of nitrogen, phosphorus, and potassium (NPK) in the soil, in addition to soil moisture. Here are some of the roles of NPK moisture sensors in soil monitoring systems:

1. Fertilizer management
2. Nutrient deficiency detection
3. Plant growth
4. Soil health

Overall, NPK moisture sensors play a crucial role in soil monitoring systems by providing critical data on soil nutrients and moisture that can be used to optimize fertilizer management, detect nutrient deficiencies, promote plant growth, and maintain soil health.

SOIL MOISTURE SENSOR:

Soil moisture sensors are a critical component of a soil monitoring system as they provide valuable data on the amount of moisture in the soil. Here are some of the roles of soil moisture sensors in soil monitoring systems:

1. Irrigation management
2. Plant growth
3. Soil health
4. Water conservation

Overall, soil moisture sensors play a crucial role in soil monitoring systems by providing critical data on soil moisture that can be used to optimize plant growth, irrigation management, and soil health while conserving water resources.

TEMPERATURE SENSOR:

Temperature sensors are an important component of a soil monitoring system as they provide critical data on the temperature of the soil. Here are some of the roles of temperature sensors in soil monitoring systems:

1. Soil health
2. Plant growth
3. Irrigation management
4. Disease management

Overall, temperature sensors play a crucial role in soil monitoring systems by providing critical data on soil temperature that can be used to optimize plant growth, irrigation management, and disease control.

ESP 32: The ESP32 is a powerful microcontroller that can be used in soil monitoring systems to collect data from various sensors and transmit it wirelessly to a central location. The role of the ESP32 in a soil monitoring system depends on the specific application c.Technical Specifications:

1.IOT Devices

2.Sensors

3.Cloud

4.Moble app

5.Short message service technology

2.3 PHOTOS OF THE PROTOTYPE:

CHAPTER III

FAILURE MODE ANALYSIS

rPoint Slide Show - TEAM-07(PPT)DSI[1][1] - PowerPoint

FAILURE MODE ANALYSIS:

Item / Function	Potential Failure Mode	Potential Failure Effects	SEV	Potential Causes Mechanism(s) of Failure	OCC	Current Controls	DET	RPN	Actions Recommended	Resp.	Actions Taken	SEV	OCC	DET	RPN
NPK sensor	Damaged electrode	Incorrect fertilization	3	Software failure/environment factors	2	Functional testing	3	18	Recommend to get new NPK sensor						0
Esp 32	produce inaccurate results	Loss of data and inaccurate measurements	4	Hardware and software failure	2	None	1	8	Regular maintenance & stable power supply						0
Temperature sensor	Effetcted by environmental factors	Incorrect readings & Safety hazards	3	Component aging & Exposure to environmental factors	4	Mechanical testing	5	60	Maintenance						0
Soil moisture sensor	Incorrect soil moisture readings & Inefficient water usage	Inaccurate readings, monitor inability	3	Physical damage , corrosion& Sensor compatibility	3	Mechanical Testing	3	27	Recommand for proper installation						0

CHAPTER IV

USER INTERACTION, FEEDBACK AND FIELD TESTING

The conceptual design document mentioned in the above chapter was implemented and the detailed design of the product was completed. To validate the product we have done the user testing at user premises. The below shown images are representing the user testing of the designed model.

User Testing:

- Farmer said he never test the soil from past two years and it was a long time process to get the results.
- It was nice to get instant results to my keypad mobile as message.

Testing photos:

FEEDBACK:

- Farmer raised a question How do I know results are   perfect are not.
- I can't bare this amount to this product can you redesign as affordable amount.

Steps to be taken for redesign of the product based on user feedback:

- * We removed GSM module and we went for IOT.

CHAPTER V

USER MANUAL

Product description:

We are going to setup this device in the field. NPK sensor is kept in the field from a depth of 4-6 inches, it measures the values NPK to test the soil for nitrogen, phosphorus, and potassium levels. Use the soil moisture to test the soil moisture content. After testing, the data is send to cloud using IOT System and sent to the user's mobile device.

Benefits of the model:

1. Improved plant growth
2. Increased crop yield
3. Cost-effective
4. Environmentally friendly

CHAPTER VI

CONCLUSION

The testing of NPK (nitrogen, phosphorus, and potassium) values is crucial for farmers in order to achieve optimal crop growth and maximize agricultural productivity. By accurately measuring and monitoring these essential elements, farmers can determine the exact nutrient requirements of their soil and crops, and apply fertilizers in the appropriate quantities and ratios. This helps to prevent overuse or underuse of fertilizers, reduces the risk of nutrient imbalances, minimizes environmental impact, and ultimately promotes sustainable and efficient farming practices. Therefore, we are developed reliable solution for testing NPK using IOT is imperative for farmers to make informed decisions and ensure effective fertilization strategies for their agricultural operations.

CHAPTER VII

APPENDIX

[1]. Xu Hong Smart Control/IOT -**System for control environment Agriculture.**

[2]. Gerald L.Rehbein, Paul D.Montain - **Soil monitoring system**

[3]. Jason stoller, Justin Koch, Brain McMahon, Derek Sauder, lan Radtke, Michael strnad, Dale koch, Mathew Morgan, Tracy Leman, Paul Wildermuth invented --**Systems, Methods and apparatus for soil and seed monitoring**.

[4]. Ankur Mathar, Paul M. Barsamian, Daneil P.Garrison, Paamila Mullan, Juan C.Mendez -**Precision Agriculture System**