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Crop recommendation based on pH value of soil using IOT

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Abstract: Farming is the most common occupation in India. As agriculture is incredibly important to feed the nation that has huge population. Nowadays, when it comes to farming, the sophisticated methods and automated machinery that are taking the world to new heights have lagged. Either a lack of knowledge about sophisticated tools or their unavailability contributes to the poverty in farming. Our Aim is to make a website by offering a variety of agriculture-related information on its website, BHARAT-AGRI has been established to improve farming. It will help the farmers to improve their productivity and profitability. Bharat-Agri is a modern farmer updated web-based application which will be helping farmers to get connected to an Agriculture center expert directly. Our application can help to make farming practices much more comfortable, predictable, confident, and profitable.

Keywords: Internet of Things (IOT), Smart Agriculture using IOT, ESP32 board, Soil Moisture Sensor, Water level Sensor.

I. INTRODUCTION

An agricultural management idea called "smart farming" aims to improve agricultural output, both in terms of quantity and quality. Technological innovation like data management, GPS, soil scanning, and the Internet of Things are available to farmers today. The purpose of innovation in agriculture research is to provide a solid foundation for managing a farm decision-support system. The concept of "smart farming" evaluates it essential to solve issues like population increase, global warming, and labor that have obtained from agricultural planting and irrigation through health and harvesting, there has been a lot of technical attention. Sensors are used to create a system for agricultural field monitoring in IOT-based smart agriculture. The use of sensors, cameras, and other technological devices in agriculture that record data on every aspect and action of farming. Since this strategy would significantly reduce the undesirable environmental externalities of contemporary agriculture, Bharat-Agri must grow and evolve from its current state. Smart cities use Internet of Things (IOT) advancements such networked sensors, lights, and meters to accumulate and evaluate data. Cities utilize this insight to strengthen their infrastructure, public services, and more. Farmers find it challenging to comprehend technical language and technological application, as well as being an economical venture.

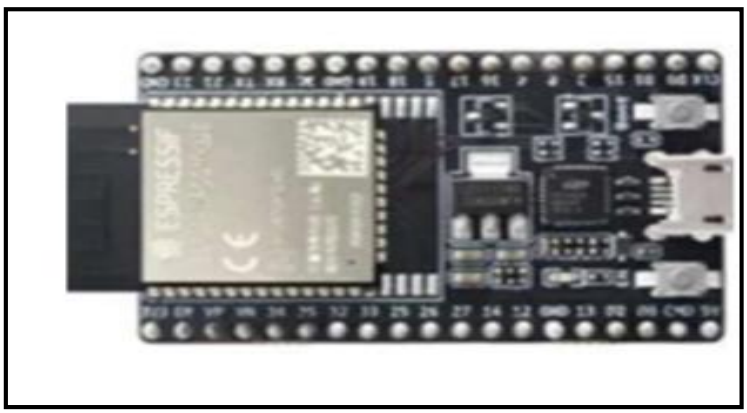

Fig 1. ESP 32 Processor

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II. PROBLEM STATEMENT

It coordinates numerous agricultural tasks and offers useful farm data on the humidity, temperature, and the soil's moisture contents. Agriculturalists utilise that smartphone application in both the Automatic and Manual modes to control water levels according on the weather. It's more convenient, which is good for farmers. The practise of agriculture takes a lot of time.

III. PROBLEM DEFINITION

Both the level of pH and the moisture in the soil should be able to be measured. in both automatic and manual modes. It need to be able to gauge pH levels as they rise or fall. We are aiming to automate system that automates agriculture to save time and resources compared to manual labor. The Internet of Things is a technology that is utilized by this system. Additionally, the device gauges the pH of fields and soil moisture. Even though this system performs well under ideal circumstances, it may still be improved when those circumstances aren't met.

IV. LITERATURE REVIEW

So many researchers have studied IOT based soil pH detection, as well as how it will help in increasing crop production and how it can be implemented.

[1] Bharat Agriculture: IOT based - Anand Nayyar and Er. Vikram Puri's smart sensor agriculture, November 2020.

This paper explains how Internet of Things (IOT) technology has transformed many facets of existence of the average person by giving everything a clever, intelligent design. IOT describes a network of autonomously configuring objects. In addition to improving farm production, the creation of IOT-based intelligent farming technology is also lowering waste and increasing cost effectiveness. This work's goal is to make a fresh suggestion for an IOT-based, smart agriculture that would help farmers obtain contemporaneously information (temperature, soil moisture) for efficient environmental monitoring enables them to practice smart farming and enhance their entirety productivity and product quality. This essay shows how the Internet of Things (IOT) reformed everyday life for the ordinary person by transforming things into a sophisticated, intelligent system. A network of autonomously configuring things is what the IOT refers to. The creation of IOT-based Intelligent Smart Farming equipment boosts farm production while reducing waste and raising cost-effectiveness. This study suggests a ground-breaking, IOT-based smart agricultural system that would provide farmers access to real-time data (temperature, soil moisture) for efficient environment monitoring. This system will allow farmers to practice smart farming, increase their overall production, and enhance the quality of their products.

[2] Level Identification of Soil pH and Macronutrients using Mobile Application through Image Processing - John Joshua F. Montanez (2021).

In this report, we demonstrate how the Internet of Things (IOT) has completely modified how the typical person lives their daily lives by turning the entire world into a sophisticated network. A network of items that can configure itself is known as the Internet of Things (IOT). Creating Intelligent smart agriculture based on IOT increases farm output while decreasing waste and improving cost effectiveness. The system that is proposed in this study is a ground-breaking and advanced IOT-based agricultural system will provide farmers access to real-time data for effective environmental surveillance (temperature, soil moisture). This will allow them to practice smart agriculture and raise their total production and product quality.

[3] Real-time Soil Nutrient detection and Analysis - Hema Pallevada, Siva Parvathi Potu, Teja Venkata Kumar Munnangi (2021).

This report describes the design of economical capsules for the detection of soil nutrients. Three distinct nutrient tests, for sodium, potassium, and phosphorous, can be done here. In the tube, there is a colour change. Three distinct nutrient tests, for sodium, potassium, and phosphorous, may be done here. Here, a colour sensor is used, and the sensor notices the test-tube's colour change and compares it to the knowledge already available regarding colour deficiency. Using Arduino, sensory data is processed, after which the farmer is informed of the deficit and the quantity of fertilizer required to remedy it. This paper presents a thorough literature review on the use of AI techniques in agriculture.

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V. METHODOLOGY

Bharat Agri is a portal from where the user can see their soil pH value after the testing of soil with IOT handset. Also, as user can see the suggested crop to be yield on the specified soil so that they can maximize their yield.

The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice.

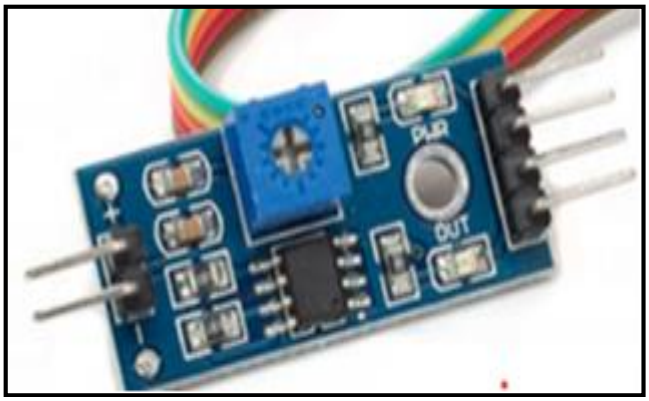

Fig 5.1 DHT 11 Sensor

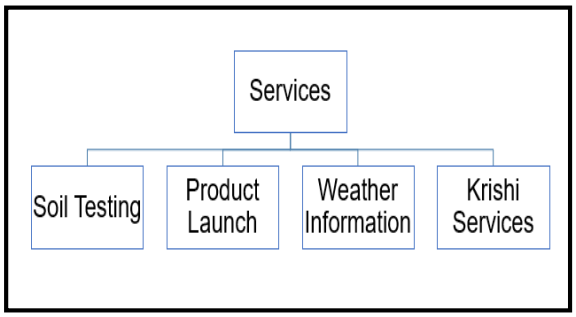

Fig 5.2 Differnet modules in website

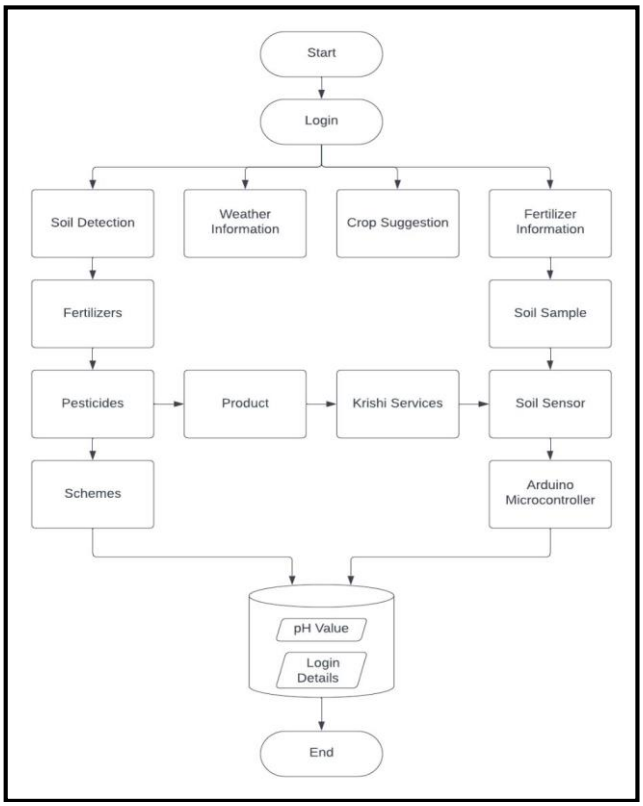

Fig 5.3 Block Diagram of Bharat Agri (Process flow)

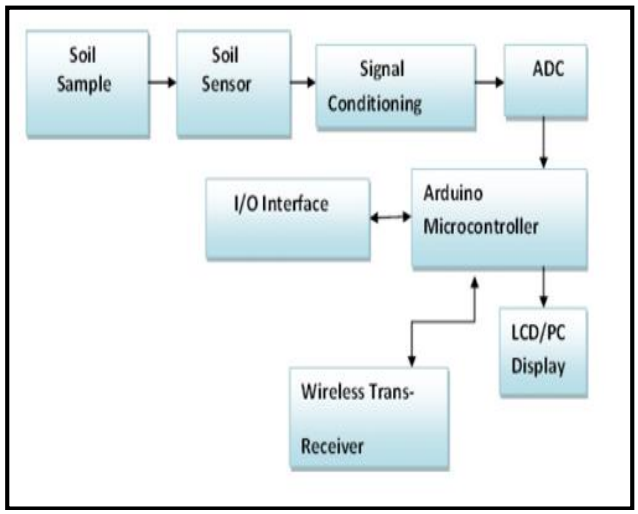

Fig 5.4 Soil pH testing module

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VI. CONCLUSION

We have created an automated Bharat Agricultural website that requires less time and resources than manual labour. This system will make advantage of technology from the Internet of Things. The technology also gauges field pH level and soil moisture. Whenever the conditions are ideal, such as with adequate lighting or lightning, this system functions well. However, it can still be improved. We are aiming to automate Bharat Agriculture system that decreases the amount of time and resources needed to complete it manually. This system makes advantage of Internet of Things technologies. The technology also measures the pH level in fields and soil moisture. Even though this system performs well under ideal circumstances, it may still be improved when those circumstances aren't met.

VII. RESULT

The proposed website was successfully implemented it contains all the different modules as defined in the Methodology. Based on the tests conducted and the data collected, it can suggest the best crop to cultivate for maximum harvest and all other modules are working properly.

The fig 7.1 show the Home Page and the different services available in the home page it includes soil Testing, suitable crop, fertilizer requirement, Fertilizer, technologies, Krishi Kendra services etc. as per methodology. Fertilizer info page containing information about different fertilizer available in the market to be used. It contains fields like soil pH value, soil Temperature, Humidity in soil, suggested crop.

Fig 7.4 is Schemes page of Bharat Agri contains information of schemes available for farmers they can apply in that government schemes and maximize the benefits. Fig 7.6 is a feedback page by using it the feedbacks collected from the farmer the accuracy of the predictions is sharpened by neglecting the invalid data.

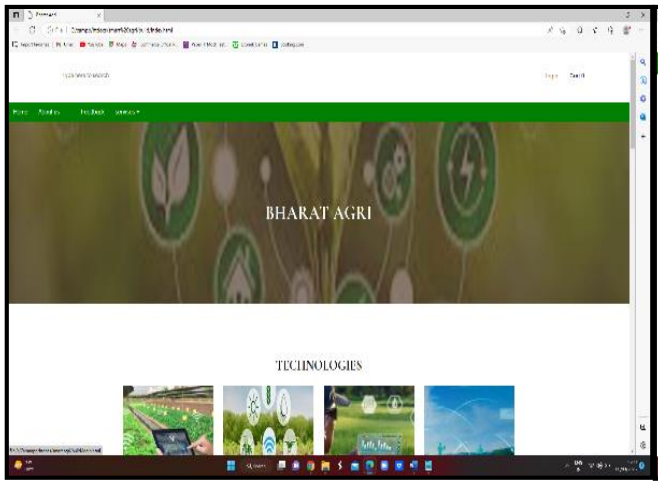

Fig 7.1 Services & Feature of Monitoring

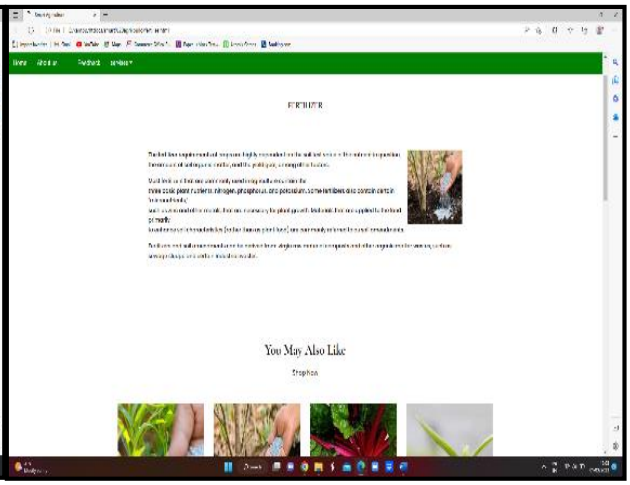

Fig 7.2 Products and Crop detection

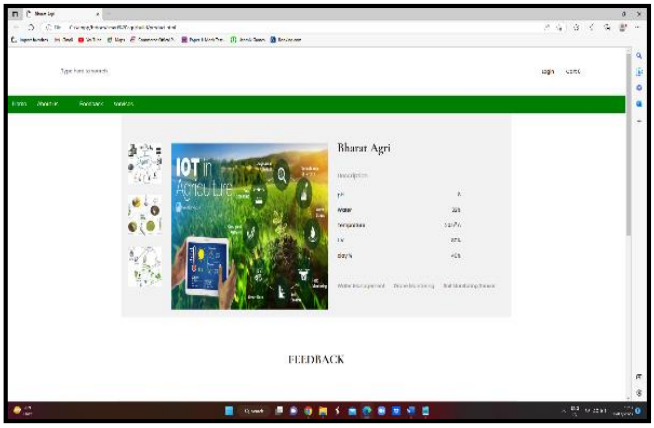

Fig 7.3 Multiple crop Technologies

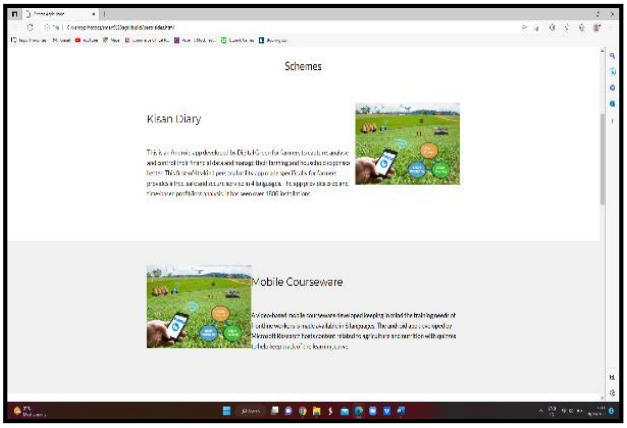

Fig 7.4 Various Scheme & suggestion

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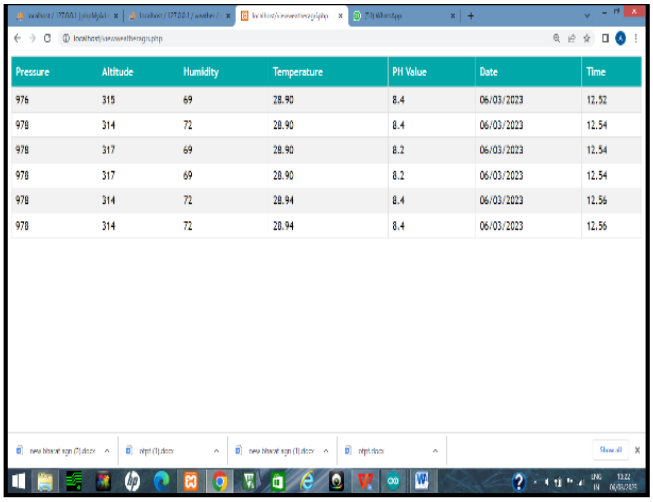

Fig 7.5 Ph scaling parameter

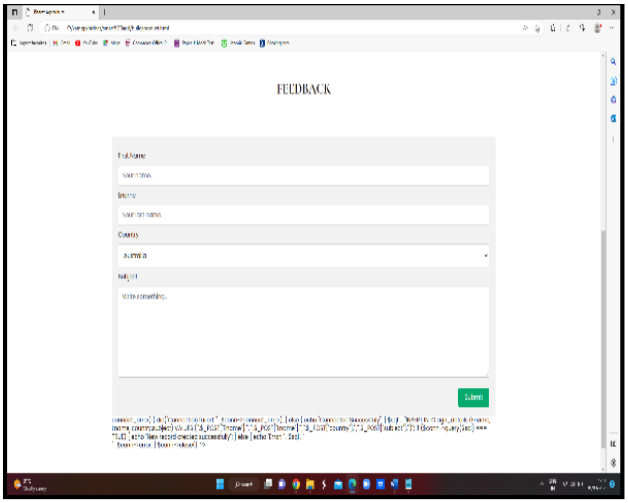

Fig 7.6 Services & Feature of Monitoring

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