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AI BASED SEED SUGGESTING SYSTEM TO ENHANCE AGRICULTURE HARVESTING

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Abstract: Agriculture generates most of the world's food. It's important for India's GDP. However, getting here wasn't easy. Degradation, population increase, climate change, illnesses, and labour shortages have hampered food supply. Artificially intelligent, data-centric, IoT-driven smart agriculture optimizes food production and improves quality to reduce losses. Machine learning and data analytics help farmers avoid costly mistakes. Our Wireless Sensor Network (WSN) - PIC (IC PIC16F877A) microcontroller, Node MCU (ESP82666), USB to UART converter, driver, relay, water pump, soil moisture, soil pH, soil NPK, temperature and humidity sensors deployment in the field proves to be an elixir. This IoT provides autonomous irrigation, crop variety prediction for sowing based on land appropriateness, and soil quality monitoring via data analysis. PC local host database and my Devices Cayenne are our farmer's remote eyes and hands. This machine learning predicts crop variety for sowing based on land appropriateness, seed amount, and fertilizer utilizing agricultural land size and Data Analysis. PC local host database and my Devices Cayenne are our farmer's remote eyes and hands.

Keywords: Wireless sensor network, Node MCU, IoT, PIC microcontroller

INTRODUCTION

India is one of 13 nations with inadequate water resources; poor water use threatens to overheat the country. This article proposes precision agriculture irrigation systems based on IoT technology to reduce the impact of inadequate water resources on India's economy. It focuses on the hardware architecture, network architecture, and software process control of the precision irrigation system. This system is sensible and practical, according to testing.

The same technology that helps us thrive indoors may also help us grow our own garden. This project proposes a machine-learning-based smart gardening system. This idea aims to reduce water use and remotely manage a garden. India is one of 13 nations with inadequate water resources; poor water use threatens to overheat the country. This article proposes precision agriculture irrigation systems based on IoT technology to reduce the impact of inadequate water resources on India's economy. It focuses on the hardware architecture, network architecture, and software process control of the precision irrigation system. This system is sensible and practical, according to testing.

India has many natural and human resources, and its economy is booming. To enhance agricultural practices and the Indian economy, Machine Learning may be used to properly estimate crop productivity. Soil quality relies on macro and micronutrients like S, K, pH, C, Mg, P, Ca, B, etc. [2]. We study, adapt, and formulate soil qualities and crop growth variables. This study examines macro and micro soil parameters such as organic content, critical plant nutrients, and crop production to rate a specific soil based on previously graded soils using Supervised Learning. [1],[9]. Hai-Yang Jia et al. [1],[10] and E. Manjula et al. [2] found that a Regression Algorithm can be implemented based on soil type and soil nutrient content, and a Classification Algorithm can select the best crop for the area. First, we preprocessed the data [8]. Some records were eliminated because they lacked attribute values [9-15].

Agriculture is the source of most food grains and raw resources for humans. It drives economic development. It also offers several jobs. The country's economy needs agricultural growth. Many farmers still utilize conventional practices, which reduces crop and fruit yields. Wherever automation and automated machines replaced humans, yields increased. Modern science and technology must be used in agriculture to increase productivity [16-20]. Most articles employ a wireless sensor network to gather data from various sensors and transfer it to a primary server utilizing wireless protocol. Data obtained regarding environmental conditions helps monitor the system. Environmental monitoring isn't enough to boost agricultural productivity. Many things impact productivity. Insects and pests may be managed by spraying the crop with insecticides and pesticides [21-26]. When the crop expands, animals and birds attack. Thefts are possible while harvesting crops. Farmers encounter storage challenges after harvesting. To solve these challenges, it is required to build an integrated system that takes into account all aspects impacting productivity during cultivation, harvesting, and post-

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harvest storage. This study presents a system to monitor field data and handle flexible field activities. The article attempts to automate and IoT-enable agriculture [27-30].

This project aims to grade soil and recommend the best crop suitable for a land. Quantized rank of the soil based on macro as well as micro nutrients is the main objective ofthe model. Data collection is done by ICRISAT Development Center and Government of Andhra Pradesh.

Arduino is the brain of this project, and 5 sensors monitor six environmental parameters that affect crop growth and nutrition:

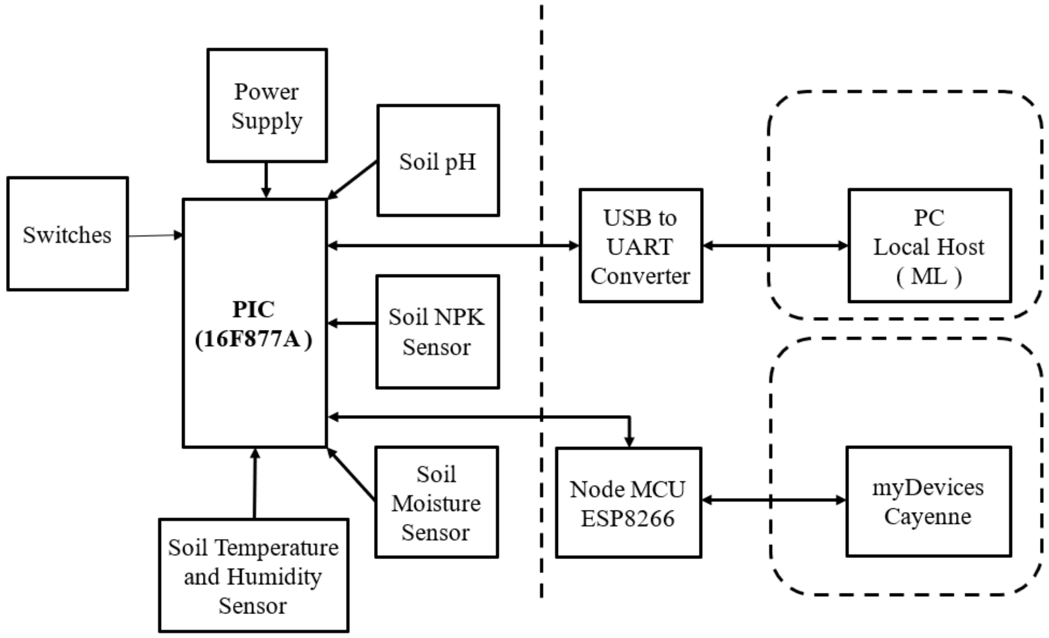

Fig. 1: general block diagram of proposed System

NPK SENSOR

Soil NPK sensor detects nitrogen, phosphorus, and potassium. NPK Soil Sensor & Arduino detect soil nutrients. To boost agricultural fertility, soil N, P, and K levels must be measured sensors monitor soil fertility. Nitrogen, phosphorus, and potassium are fertiliser ingredients. The soil nitrogen, phosphorus, and potassium three-in-one fertility sensor detects these nutrients. Optical transducer detects soil NPK nutrients. The optical transducer is a detecting sensor with three LEDs and a photodiode. LED wavelengths match nutritional absorption bands.


Fig. 2: NPK sensor

AIR QUALITY SENSOR / GAS SENSOR:


Fig. 3: MQ135

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Few realise that plants and trees require fresh air for development. Polluted air makes plants sick and reduces fruit and vegetable quality. Polluted air makes crops more susceptible to disease and insects.

To measure crop growth, we use a MQ 135 air quality sensor. MQ 135 features a breakout board with 4 connections, but we'll just utilise Vcc, GND, and Aout, the sensor's analogue output.

Analog output rises when MQ 135 detects harmful gases and vice versa. Analog output is transformed to 10-bit digital value and percentage.100 percent suggests a lot of air pollution, thus lower is preferable.MQ135 sensor cannot identify the polluting gas detected.

MQ-135 will produce proper signal when the sensor reaches optimal temperature. The sensor stays warm throughout operation and takes 5 minutes to attain optimal temperature.

TEMPERATURE AND HUMIDITY SENSOR:

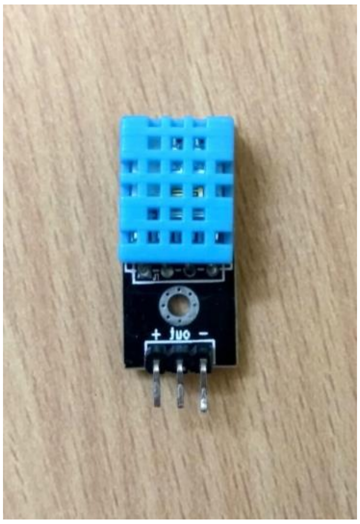

Fig.4: DHT11 Temperature sensor

Just like humans, plants are sensitive to temperature and humidity. To keep comfortable, we plan for winter, summer, and rainy seasons. Similarly, plants prepare for approaching seasons to either survive or thrive with fruits and blooms.

Temperature and humidity affect when crops and fruits may be cultivated or harvested. Digital sensor DHT11 measures temperature and humidity for this parameter.

DHT11 sensors from various manufacturers may have different pin configurations than displayed. So identify the relevant DHT11 pins (Vcc, GND, and output).

SOIL MOISTURE SENSOR:

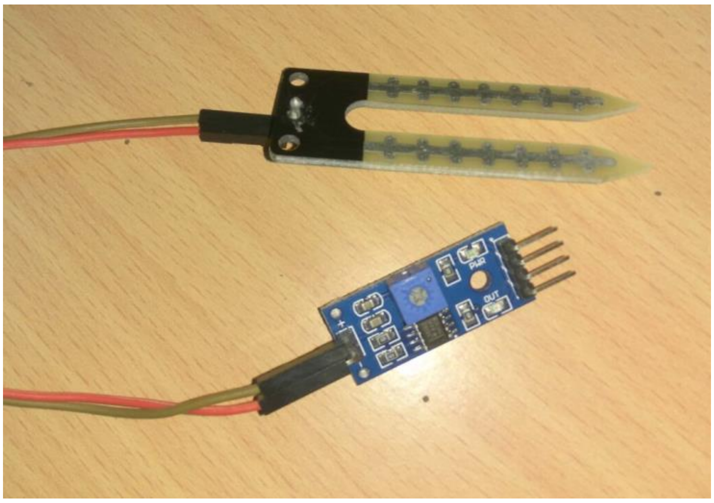

Fig. 5:Soil Moisture Sensor

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Plants contain 90% water. Plants' water needs vary. The quantity of water must be irrigated daily depends on how effectively the soil can store moisture, the season, temperature, and humidity.
Many farmers irrigate their crops more than necessary to ensure they have enough water, which wastes water. The pictured senor, which contains two prongs (electrodes), measures soil moisture. This analogue sensor outputs to Arduino.

Fig. 6: Soil Moisture Pins

We'll just utilise this sensor's analogue output, like other analogue sensors stated here; the output is transformed to a 10-bit digital number and then a percentage out of 100. 0% dry, 100% wet. This sensor showed 50 to 70% soil saturation. A pH sensor is one of the most essential tools that's typically used for water measurements. This type of sensor is able to measure the amount of alkalinity and acidity in water and other solutions. When used correctly, pH sensors are able to ensure the safety and quality of a product and the processes that occur within a wastewater or manufacturing plant. In most cases, the standard pH scale is represented by a value that can range from 0-14. When a substance has a pH value of seven, this is considered to be neutral. Substances with a pH value above seven represent higher amounts of alkalinity whereas substances with a pH value that's lower than seven are believed to be more acidic. For instance, toothpaste typically comes with a pH value of 8-9. On the other hand, stomach acid has a pH value of two.

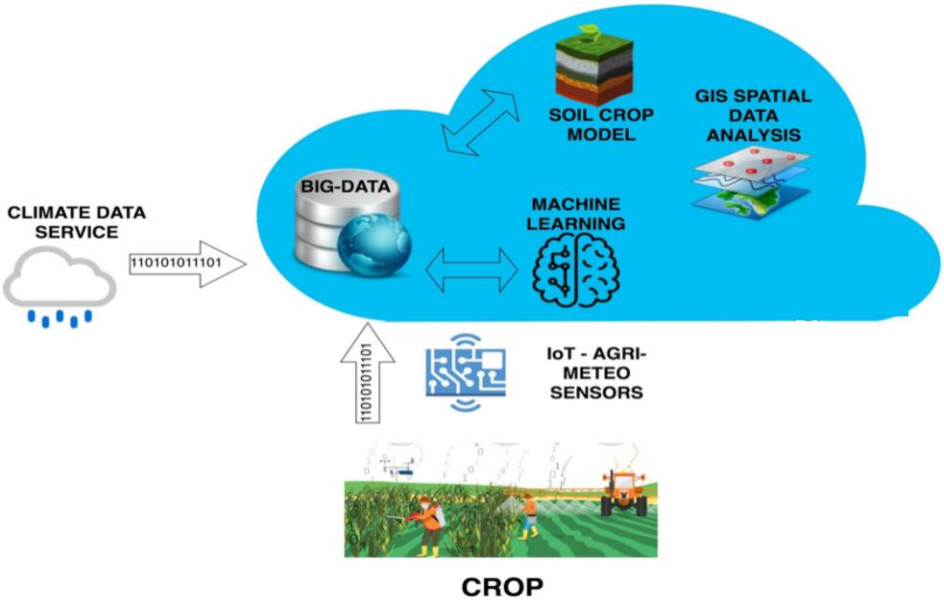

Fig. 9: Schematic diagram of proposed Machine Learning algorithm

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RESULTS AND DISCUSSION

Most farmers employ enormous tracts of land, making it impossible to monitor each corner. Uneven water sprinkles may occur. Bad harvests lead to financial losses. Smart Irrigation System employing Latest IoT technology helps farmers in this case.
Smart irrigation can automate the whole system. We're constructing an IoT-based irrigation system using ESP8266 and DHT11. It automatically irrigates depending on soil moisture and sends data to Thing Speak Server to monitor land status. A water pump will sprinkle water on the ground based on Moisture, Temperature, and Humidity.
We built a comparable Automatic Plant Irrigation System that delivers smartphone notifications but not on IoT cloud. Rain alarm and soil moisture detection circuits may also assist develop Smart Irrigation.Also, we built an IoT-based soil moisture monitoring device; see the video below.
This completes the IoT Smart Irrigation System lesson. After watering, turn off the engine when the earth is saturated enough. You can develop a smarter system with crop-specific controls. If you have problems with this project, comment below or visit our forums for additional questions and answers.

After signal conditioning, humidity, soil moisture, float level sensor, and soil temperature are communicated through IOT module using ESP controller with wifi shield to the PC of the proposed irrigation system and then to the user device via PC with python IDE setup. The system employs supervised Machine Learning methods like KNN Classifier to propose seed amount and fertiliser based on error analysis. This approach will lessen farmers' struggles. Analysis of critical soil parameters, followed by grading and crop prediction. This will provide farmers with the essential knowledge to maximise their surplus and eliminate his troubles.

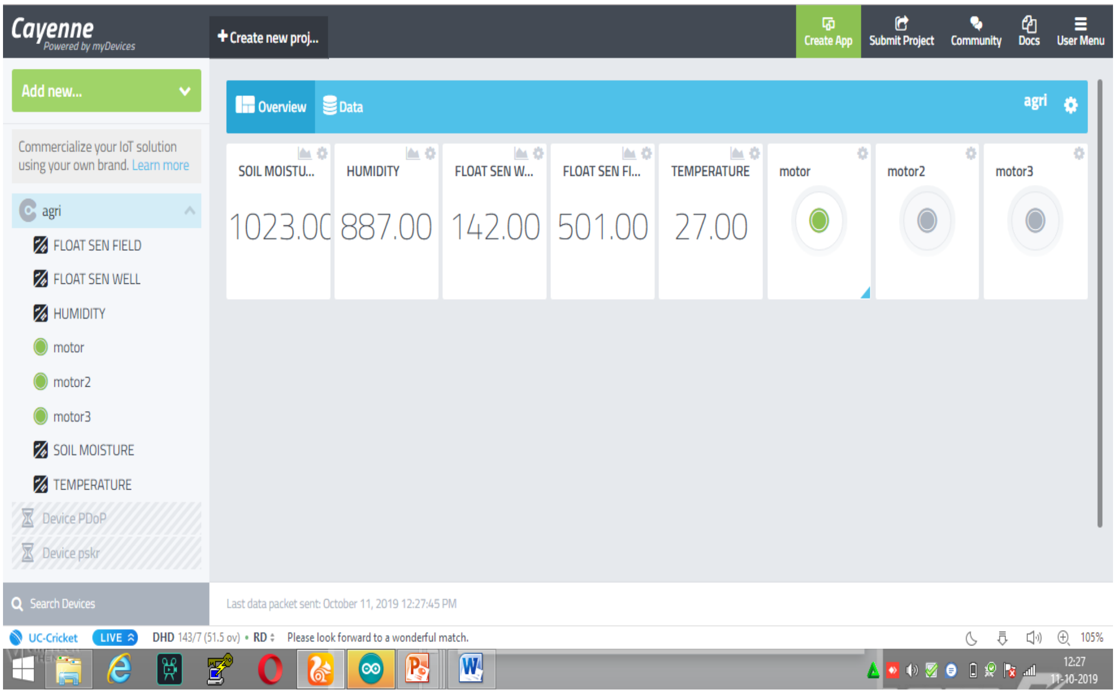

Fig. 10: Shows Various Sensor Values relative to time

After signal conditioning, humidity, soil moisture, float level sensor, and soil temperature are sent to the user device through the cayenne open source IoT server.

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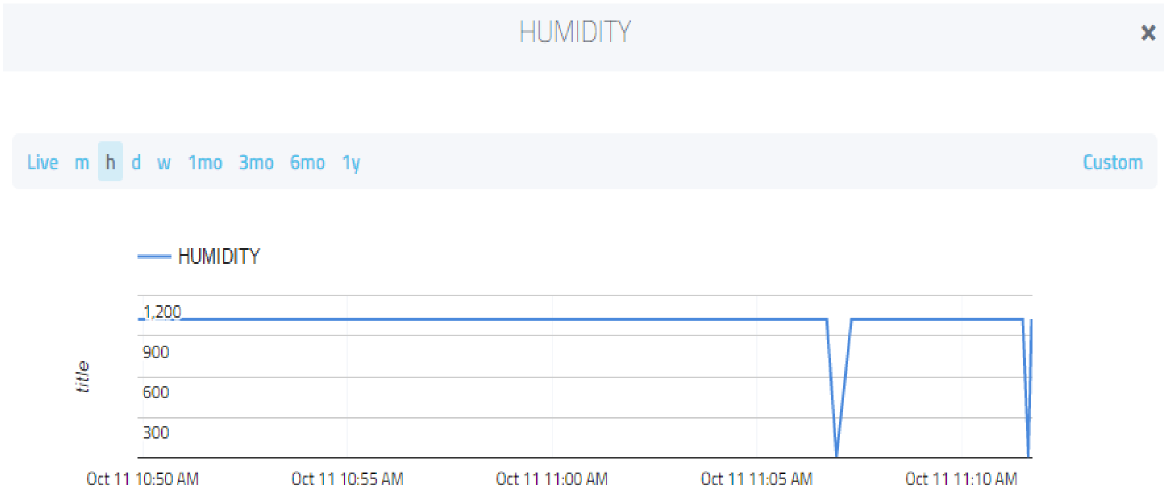

Fig. 11: HUMIDITY SENSOR

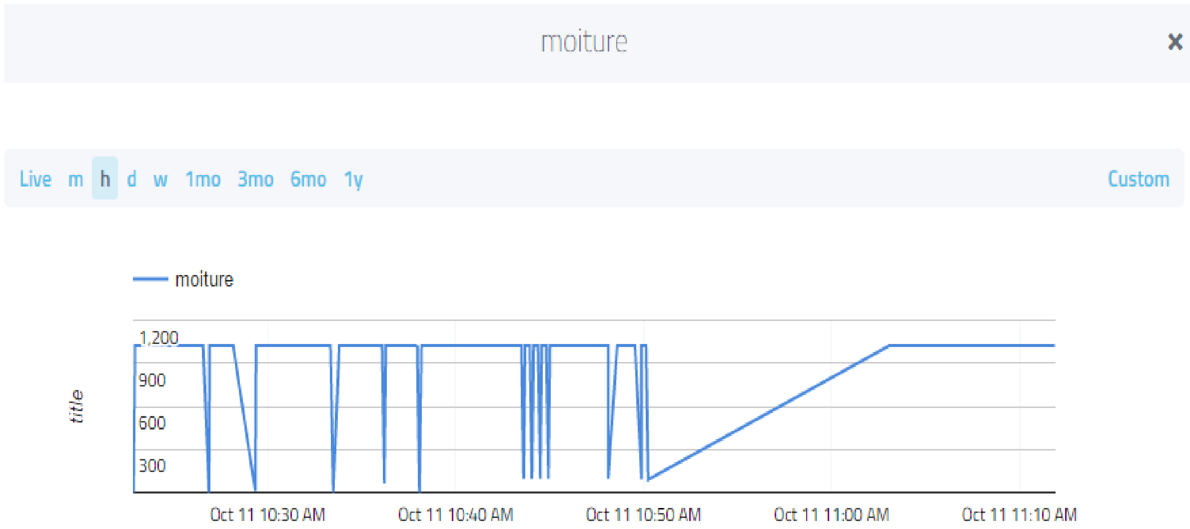

Fig.12 :SOIL MOISTURE SENSOR

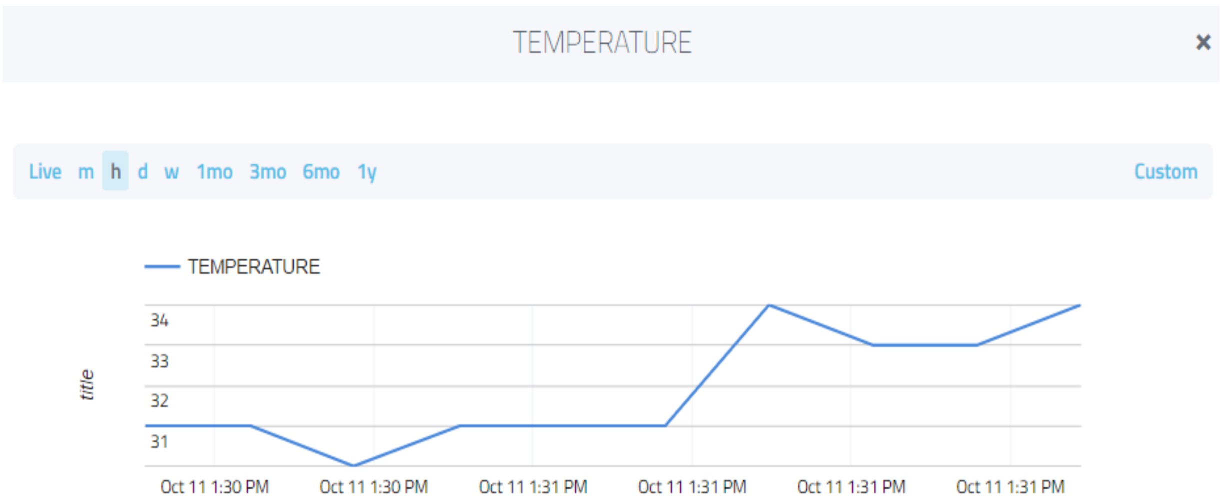

Fig. 13: TEMPERATURE SENSOR

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Above graph shows real-time soil and crop data, including temperature, humidity sensor, moisture, and water level. The user views humidity and temperature relative to time. The user sends the relevant signal to the field section whenever the signal deviates from the intended irrigation system's reference span. When soil moisture is below the reference value, a signal is delivered to the user via the IoT module and server. The user device receives the signal, and a command is issued along the same way to take remedial action. The arduino UNO's LCD module displays humidity, temperature, and moisture sensors. PIC controller connects IOT module.

Cayenne is an open-source Internet of Things application and API for storing and retrieving data via the Internet or a LAN. Cayenne offers sensor recording, location monitoring, and a social network of items with status updates. Cayenne supports IoT apps.

CONCLUSION AND FUTURE ENHANCEMENT

Thus, the system can monitor agricultural factors like temperature, humidity, wetness, leaf growth, and spray water and pesticides through IOT module. It reduces manual labour. Arduino UNO, temperature/humidity sensor, soil moisture sensor, NPK sensor, pH sensor, and IoT module were used. Cayenne's webpage/app may be used to monitor the system, and mobile users can access sensor readings on the server. Reduced predator damage increases output. The system's ultrasonic sensor monitors plant health; users may see their plants online at any time. Future gear, like the corn-tending robot, combines data-collecting software with robots to increase yields and decrease losses. IoT sensors can provide farmers with exact data on crop yields, insect infestation, and soil nutrition.

This review proposes aggressive agricultural water management. The system's microcontroller increases system life by lowering power usage. It's utilised to irrigate Cricket or Golf stadiums and public gardens. Automated irrigation systems are popular and have a bright future. It saves time, eliminates human mistake in controlling soil moisture levels, and maximises net profits based on sales, product quality, and growth. All observations and practical testing confirm this project solves agricultural irrigation difficulties. Implementing such a system in the field may increase agricultural output and reduce water waste. Our suggested approach would benefit farmers, who make up 60% of our country's workforce. Our technology increases agricultural yield by using IOT and sensors to monitor irrigation outputs and safeguard farms. Farmers may utilise remote technology to activate/deactivate renewable-energy water pumps, keeping the environment clean.

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