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FORECASTING A PLANTATION USING MACHINE LEARNING AND INTERNET OF THINGS

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ABSTRACT: Farming has been crucial to the human race's survival for quite some time. Because of the ever-increasing demand from consumers, the steadily decreasing number of producers, and the widespread absence of adequate agricultural expertise, a substantial amount of food has been wasted throughout the years. Predicting the optimal crop for a given area and plot of land employing IoT plus computational methods might help enhance productivity. In the proposed technique, a sensor-equipped agricultural stick is put on the ground to continuously gather data. This unprocessed information will be sent to the cloud for analysis.By conserving water and reducing effort, the framework outperforms inefficient conventional agricultural practises. The improved framework was contrasted with the present-day one. The health of the population and the integrity of the building have been placed in jeopardy by the recent recurrence of food security and quality concerns. There is a growing trend towards using data innovation to propel the development of modern agriculture and gardening. For a very long time, weather and climate have been completely ludicrous. This motivates many Indian ranchers to learn eco-friendly gardening techniques.

***Keywords: Smart Farming, IOT, Deep learning*.**

I. INTRODUCTION

Agriculture is an essential industry for human survival. When compared to other developing and developed nations, India's agricultural sector's contribution to GDP, at about 18 percent, is relatively small. The agri-culture industry has taken heavy losses because of a lack of modernisation and a steadfast adherence to outmoded agricultural practises. Thanks to technological advancements,

increased mobile phone coverage, and decreasing data prices, the Internet of Things (IoT) may now be introduced in the agricultural industry even in outlying areas. Soil moisture, air temperature, and creativity" written by Beecham researchers. Increasing agricultural productivity is vital for securing greater returns and agricultural profitability. The biggest obstacle to productive farming is because of the randomness of things like rain, cold, moist ground, and other meteorological conditions. Since the state farm stress is an excellent predictor of the quantity of farmer cell vapour water, rank is also considered to be among the greatest important climatic parameters for farming.

Even However, the framework of the internet also incorporates the sharing of interpreted information with other consumers and face-to-face encounters, especially when there's a lot of moisture in the air. The global web of Things (IoT) is a network that links physical objects with unique identifiers together so that data may be automatically transmitted between them. The Internet of Things (IoT) expands daily as more gadgets are linked together throughout the world. Many fields make use of IoT, such as precision farming, smart grids, environmental monitoring, and so on. Because of its extraordinary ascendability, practicality, and widespread presence, the internet of things is gaining traction in the agricultural business. There are a number of environmental conditions that might alter agricultural methods.

Consequently, this study focuses mostly on the procedures associated with crop production. Using Machine Learning, Deep Learning, and other techniques, it provides solutions to a wide range of agriculture issues. Primarily, it explains how to choose crops for different climates, what nutrients they require, and how to calculate GDDs. It helps to determine which insecticides will be most effective against a certain weed. Since many insects are harmful to crops, it is recommended to apply pesticides depending on the insects found in the field. Finally, the ability to estimate costs is essential in the modern business environment. Significant losses might be incurred due to the crisis and uncertainty. Therefore, it is necessary to predict the cost of producing a crop in order to plan for future occurrences that cannot be known with certainty.Background research is the bedrock upon which every study is built. In this paragraph, we will examine the most important aspects.

The primary objective of this research is to create a smart agricultural system that will boost crop yields. By periodically analysing the soil, it helps you choose the best crop for rotation. Selective irrigation, a method for improving irrigation systems, is also discussed. Low-cost smart farming modules may now be produced thanks to a solution that integrates IoT and ML that was released in. The algorithm also makes use of novel techniques to boost the accuracy of the outcomes. The use of machine learning to precision agriculture is explored with the help of, which looks at the topic in the framework of food cultivation and agriculture. In this research, we examine how machine learning stacks up against other types of AI in the field of agriculture.

A prototype of an Internet of Things-based smart farm that unifies food production, energy production, and water management is also shown as a case study. It also provides a smart agriculture IoT system based on deep reinforcement learning, with four distinct components (cloud computing, edge computing, rural data transmission, and agricultural data collection). Combining agricultural production with certain cutting-edge digital technologies, like cloud computing and artificial intelligence, is central to the strategy's goal of increasing food availability. For real-time smart decisions like determining how much water should be used for irrigation in a setting with rising crop growth, the most powerful AI model, deeper reinforcement learning, is installed on the cloud layer. The algorithms component of the research covers crop recommendation using parameters like N, P, and K values with the help of ML algorithms. A decision tree algorithm is proposed for use in a smart irrigation system that takes temperature, humidity, and moisture levels into account. has carried out extensive research into many machine learning concepts for a web-based smart agricultural system. The supported vector machine (SVM) and algorithms for decision trees are introduced to help obtain the crop suited for the given soil data and aid increase the growth applying an optimal farming technique. The use of machine learning in conjunction with computer vision to classify a different set of crop photographs being investigated as a means of tracking crop quality and gauging production. Wireless sensor networks are the underlying technology. A recommended solution architecture is presented for developing precision agriculture (PA) KPIs. It was proposed that an IoT-based smart farming system use a machine learning approach called WPART (Wrapper feature with PART classification technique) to predict crop production and thirst for efficient decision-support. An sophisticated irrigation system for accurate farming is proposed using the IoT. Since it contains feedback, the system continues to function better in any climate for any length of time. In order to predict the volumetric content of soil moisture, irrigation schedule, and the geographic distribution of water needed to irrigate agricultural land, the method employs a long short-term memory chain (LSTM).

II.LITERATURE SURVEY

A. Anusha and coworkers proposed the RMS (Remote Supervision System) [1]. Several sensors are used to measure conditions including temperature, humidity, and stickiness. This information is sent to the microcontroller. The control part checks the data using edges as values. When quantities in the collected data exceed the predetermined bounds, the farmer is sent a text message with the necessary instructions. Both manual and automatic settings are accessible. Thanks to the built android application, the farmer may use his smart phone to remotely verify the data.

Rahul Dagar and colleagues [2] used a poly house strategy to implement IoT. The crop is protected from the sun and torren-tial rain by the poly house. Because it is roofed over fully, the use of temperature control devices like air conditioners, heaters, and the like is straightforward, and the presence of pests is kept to a minimum. Air heat, soil pH, moisture content of the soil, and humidity may all be monitored using sensors installed in the polyhouse. The environment is easy to control, which results in high productivity and quality.

A.Nigam et al. [3] included environmental elements in their predictions for the crop's brand and yield. Rainfall and temperature are the two most important factors in agricultural output. Because the information being stored is sequential, algorithms like long short-term memory and basic neural networks with recurrent neurons are used. Random Forest regression was the most effective method for predicting yields. The data is utilised to make predictions about the crop and its production.

Anuja Chandgude et al. [4] used sensors to collect data on environmental factors as the humidity, wind speed, temperature, and sunshine. In order to foretell the onset of agricultural diseases, the collected data is fed into an ANN Machine Learning Algorithm. The algorithm does this by comparing the gathered data to the publicly avaliable dataset.

R. Wireless sensor network (WSN) nodes were used by P. her et al. [5] to collect data on the surrounding environment. From the WSN node, the data is sent through radio frequency transmission to the base station. The detected data will be processed by the decision-support appliance at the base station, which will then generate the necessary message for transmission to the farmer. This programme will advise you on when to water, how much nitrogen to apply, and other such details. An Android app has been developed to facilitate communication with the farmer.

Using historical data, S. Medar et al. [6] estimated agricultural production using the Naive Bayes method and the KNN (K- Nearest Neighbour)
technique. They have developed a Java software that can estimate harvest size. This software's three main features are data management, testing, and analysis. Accuracy data allow for the selection of the method that delivers the best accuracy. This helps farmers choose crops with a high potential harvest.

V.T. Varghese et al. [7] discuss the many applications of Wireless Sensor Networks (WSNs). We employ WSNs with moisture, temperature, and precipitation sensors in our study. To determine the optimal crop, irrigation amount, and harvest, a context engines is used. Messages may be sent from the smartphone app to the context engine.

An inexpensive smart farming module was presented by R. Varghese et al. [8] utilising machine learning and the Internet of Things. Through the Internet of Things (IoT), the sensorequipped ground module may communicate with a cloud-based data centre. Predictions about the state of crops in the future may be made in real time by employing machine learning techniques used on the cloud. When the water supply becomes low, the farmer will get a warning from this system as well.

Multiple instance regression was used by
Subramanian et al. [9]. This hypothesis is examined by looking at how crop yields and the challenges of determining aerosol depth are related to one another. Two credible remote sensing datasets provide the basis for these calculations. Datasets on agricultural production and aerosols are two examples.

The Integrated IoT Agriculture Stick, introduced by Anand the Nayyar et al. [10], puts into practise the "Plug and Sense" concept. This stick gives farmers access to information in the moment. This data is accessible on many platforms through thingsspeak.com. In addition, a collaboration with cloud computing makes this data accessible from anywhere in the world. Big Data analyses for a wide range of data kinds are made possible by this technology as well. The accuracy of sensor data is 98%.

Predicting Crops and Their Reliance on Fertilisers Sravan Kumer et al. [11] recommend using ML methods, so keep that in mind. India is mostly selfsufficient due to its reliance on crop production and the expansion of the agricultural industrial sector. India's agriculture yields are very vulnerable to the unpredictable weather. Climate variables, such as temperature and precipitation, are not the only elements that affect crop development; a number of soil parameters, such as phosphorus. These nitrogen, potassium, water in the soil, crop rotation, and the temperature of the surface, all have a role. India is now making great strides in the direction of technological progress.

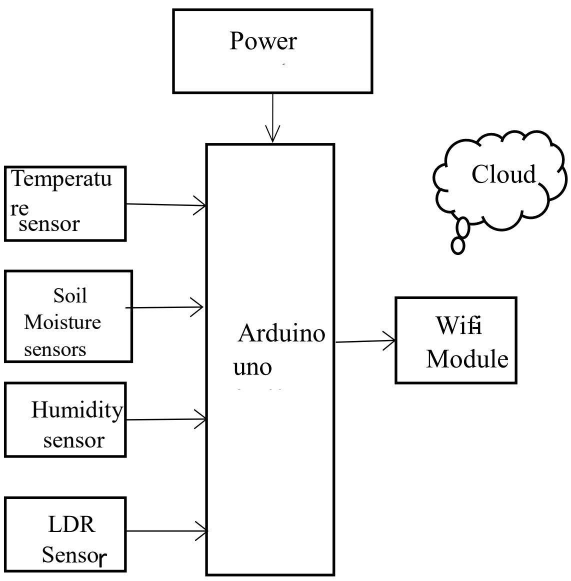
The use of technology in agriculture will be beneficial, leading to greater agricultural yields for farmers. By monitoring farms and providing assistance to the planter, the proposed article defines smart agriculture and its benefits. The repository contains information provided by the Indian Meteorological Department (IMD) that may be used to identify which crops should be planted when and where. This data includes temperature, rainfall, and soil characteristics.

Akash Raj N, age 12, has presented a machine learning-based IoT-based agriculture automation system. More and more, large-scale applications need the use of agro automation systems to keep track of a wide variety of variables. Farmers' principal problems may be mitigated by the "IoT based Agro Robotics Technology using Artificial Intelligence Algorithms," which is built from a plethora of sensor fusion and the confirmation of findings in a hybrid app. A fully trustworthy and secure semi-autonomous agro robot is implemented for the objective of simplifying farmers' work. Monitoring and analysis are performed using the Pioneer Technologies ThingWorx cloud computing platform, and the accuracy of the experimental data is ensured by factoring in a number of case studies that were largely addressed throughout the development of this system for use in agriculture.

Ramesh Medar [13] proposes a method for predicting crop yields by using machine learning methods. The agricultural industry has a major effect on the American economy. The rise of civilisation may be traced back to agricultural practises. India's economy is heavily dependent on agricultural output. Therefore, we can contend that agriculture can sustain our country's economy. When organising a farm, it's important to give serious consideration to each potential crop. Market price, yield, and government policy will all play a role in determining which crops are prioritised. Our Indian economy as a whole may benefit from several developments in the agricultural sector. Simple machine learning methods may be applied to the agricultural business and lead to significant improvements. Accurate and useful knowledge on a wide range of issues is just as important as the advancements in agricultural gear and technology. The purpose of this research is to use the crop selection strategy to aid farmers and agriculturalists in dealing with a wide range of problems. This maximises the pace at which crops are produced, which is good for the Indian economy.

Subhead Mishra [14] has suggested using machine learning methods in crop production in agriculture. This approach is cutting edge in the realm of agricultural crop management. Directorate of statistical and economic analysis needs reliable forecasts of crop output in order to make important policy decisions including import/export, pricing, and distribution of goods and services. It is important to keep in mind that the preceding figures are just approximations, since they call for a lot of descriptive assessment based on a lot of different qualitative criteria. This is why it's important to build impartial but statistically reliable forecasts of crop yields. Technological developments in computers and data storage have enabled the accessibility of vast amounts of previously inaccessible information.

Findings:Machine learning is only one example of a cutting-edge technology that combines data comprehension with agricultural production assessment, which is necessary given the intricacy of the insights that may be obtained from this raw data. This research intends to assess these cuttingedge methods in order to identify a significant correlation between them and the wide variety of variables already included in the database. Applying/Improving: a Handful of Techniques, Including Statistical Belief Networks, and Information Fuzzy The networks, Decision Forests, and Regression Analysis. Periodic assessment, Markov chain modelling, the clustering of k-means, k-closest neighbour, and help vector computation were all studied in relation to their uses in agriculture.



III. PLANTATION PREDICTION USING IOT AND MACHINE LEARNING

The last decade has seen an increase in the unpredictability of climate change and floods. Therefore, many Indian farmers have recently implemented "smart agricul-ture systems," also known as climate-smart agricultural practises. Smart agriculture is an integrated and directed information technology that is being implemented with the help of the World Wide Web (WWW) of Things (IOT). The Internet of Things is rapidly expanding, and whole Wi-Fi networks commonly make use of it nowadays. The current status of the agricultural system served as the basis for this project's investigation into and testing of Universal Object Inter-action (UOI) transducer innovation and Wi-Fi network integration.The primary goal is to collect information at critical points in the growth of the agricultural environment so that essential agriculture services, such as warnings through brief messaging services and crop advise, may be made widely avaliable

Figure 1: Proposed Model

A. Temperture sensor:

A temperature sensor is a kind of electronic instrument that may record, monitor, or convey changes in temperature by taking readings from its surrounding air, water, or ground.

B. Soil moisture sensor:

Soil moisture sensors are used to quantify the quantity of water present in the ground. Such sensors may be permanently installed or portable, in the form of handheld probes. While fixed sensors are permanently put in the field at predetermined depths and locations, portable moisture measurement probes allow for widespread soil moisture monitoring. A soil moisture transducer reports back to the micro-controller on whether the ground is dry or wet.

C. Humidity Sensor:

A humidity sensor detects, measures, and reports the air's relative humidity (RH), as well as the concentration of water vapour in a gas or gaseous mixture (air). Adsorption and desorption of water is linked to measuring relative humidity. The humidity sensor will detect the current weather and relay that information to the microcontroller. There is a serial connection between the GSM or the microcontroller.

D.LDR Sensor:

A light-dependent resistor (LDR) is a photoelectric element. When exposed to light, its resistance instantly changes. An LDR's resistance value may vary by several orders of magnitude. As illumination improves, the resistance value drops. The presence and intensity of light may be detected and measured with the use of photo resistors, also known as Light Sensitive Resistors (LDR).

E.Arduino Uno

The voltage sensors are connected to the Uno Arduino development board through the A0 and A1 pins. By simulating the battery, we can gauge its internal resistance. The battery voltage is an open circuit voltage since it is measured with no loads attached. When no current is flowing, a voltage drop is zero. Therefore, the voltage of the open circuit should be equal to the optimum battery voltage. This fall is studied by the Internal Resistance. When the voltage drops among the resistors are added together, it is found to be equal to the optimal voltage of the battery. The Arduino Uno receives the measured voltage readings and transmits them to the server through the Wi-Fi module.Access the information gathered by the hardware by login into the thingSpeak software. The discharge voltage information will be used to adjust the default parameters, and the result, or the remaining number of cycles, may be seen in the graphical user interface on our desktop. The amount of cycles will influence how long a lithiumion battery will last.

F. Wifi Module:

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The development board for the Arduino Nano WiFi is just an Ar-duino Uno with a built-in WiFi module. The AT-mega328P-based electronic board incorporates the ESP8266WiFi Module. The ESP8266WiFi Module is a standalone SoC that has a TCP/IP protocol stack and can access your WiFi network.

G. Cloud:

Despite its nebulous meaning, "cloud" refers to a large-scale system of machines, each of which performs a distinct function. The cloud is not a real location or server, but rather a vast, interconnected network of faraway computers. Cloud computing is the distribution of computing services via the Internet ("the cloud"), such as servers, storage, databases, networking, software, analytics, and intelligence, to facilitate rapid innovation, flexible resources, and economies of scale. A cloud ML platform provides the computing resources, data storage, and other services required to train machine learning models. The rapid advancement of ML algorithms made possible by cloud computing has made machine learning more accessible, adaptable, and economical.

H. Random Forest:

well-known method for ML The supervised learning framework from which Random Forest emerges. It may be used to solve classification and regression problems in machine learning. To tackle challenging problems and improve model performance, it is based on the concept of combined learning, which involves merging many classifiers. As its name suggests, this "random forest" is a classifier which incorporates multiple sets of decision trees that evaluate different subsets of the data being studied and picks the average value to enhance the predictive ability of that dataset."The random forest takes into account forecast from all of the trees rather than just one, and then makes its final prediction based on the majority of the trees' votes. The greater the amount of branches in the forest, the less likely it is that you will achieve higher accuracy or overfit.

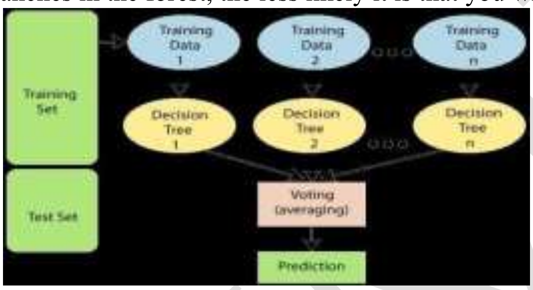

Figure 2:Random Forest algorithm

After generating the random forest by combining N decision trees, predictions are generated for each of the individual trees.
Follow the steps and look at the diagram below to see how it works:

First, we will randomly choose K data points from the original training set.

Step 2: Construct the connected decision trees for the selected data subsets.
Third, decide on N as the total number of nodes in what choice trees you want to build.
It's back to the drawing board for Step 4!
In Step 5, we'll look up the predictions for the newly acquired information in each decision tree and assign them to the classification that received the most votes.
Input Information Required Before Random Forest Algorithm Training Set Adaptation
Predicting the Results of a Test The result's accuracy is put to the test (Confusion matrix is created).
Verify if the creation (result) is accurate.
The Random Forest classifier takes as input the training set. This decision tree classifier is a close relative of this method. Each data point in the user_data represents a single user, while the purple or green zones reflect the prediction areas. The purple area denotes users whom did not buy an SUV, whereas the green area depicts buyers.

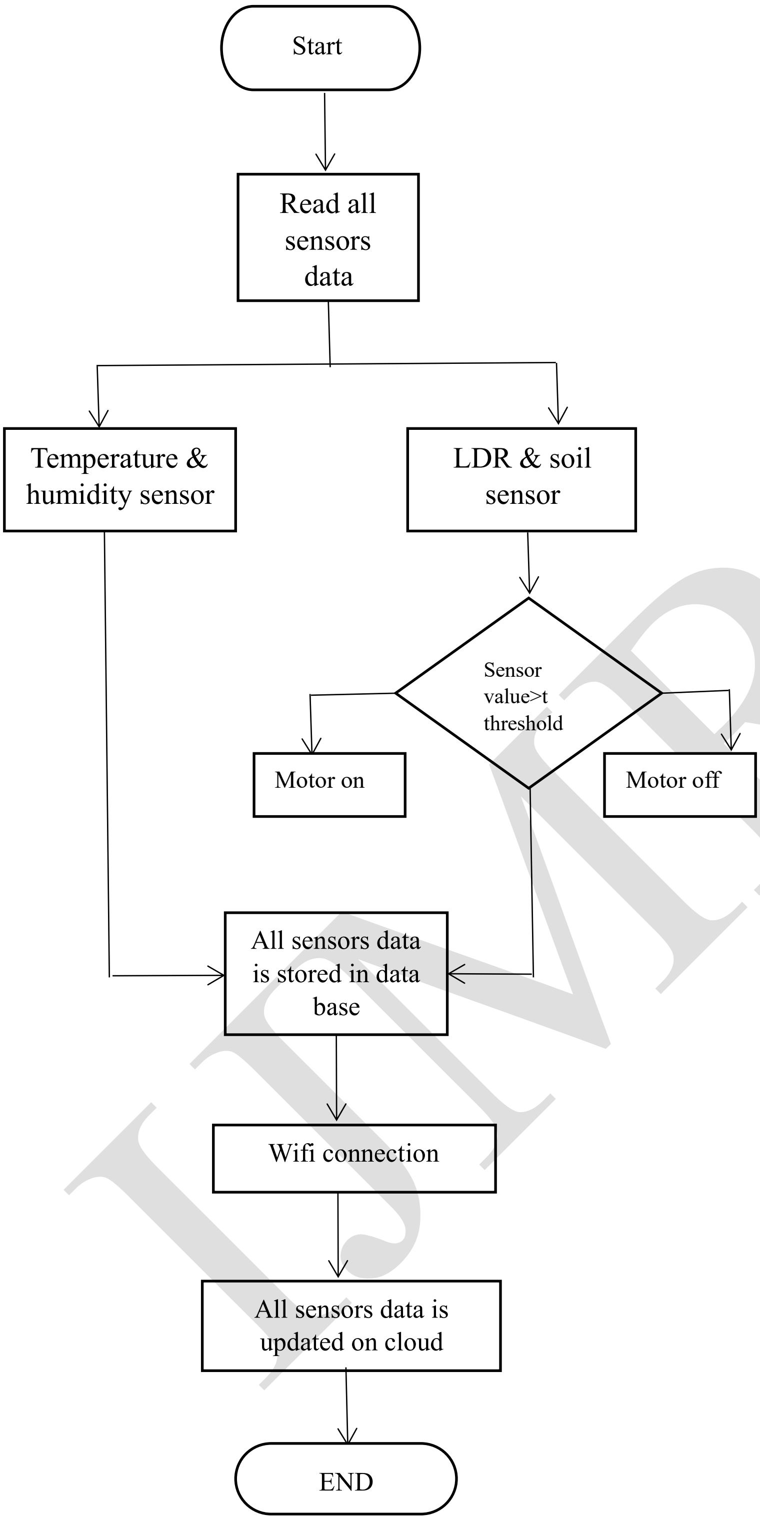
Start
Read all sensors data
Temperature & humidity sensor
LDR & soil sensor
Sensor value>t threshold
Motor on
Motor off
All sensors data is stored in data base
Wifi connection
All sensors data is updated on cloud
END

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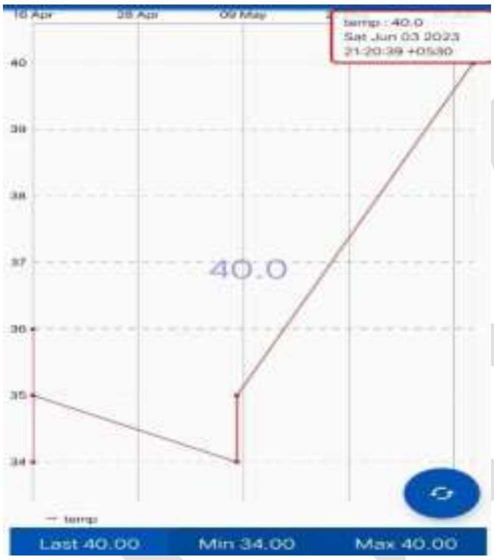
Figure 3: Flow Chart

IV.RESULT AND ANAYLSIS:

The goal of this study is to use sensor data and climatic factors gathered from four distinct sources to make planting predictions. This information will be kept on a database server. The plantation's future has been predicted using an algorithm implemented throughout the server's database. To make accurate predictions about the plantation, we're building a regression model using data collected from sensors and the crop itself.
Using a quartet of sensors would get the same results, but with more precision. The Random Forest Classifier, or RFC, excels in machine learning because it provides the highest precision.

OUTPUT GRAPHS

4.1 Temperature sensor

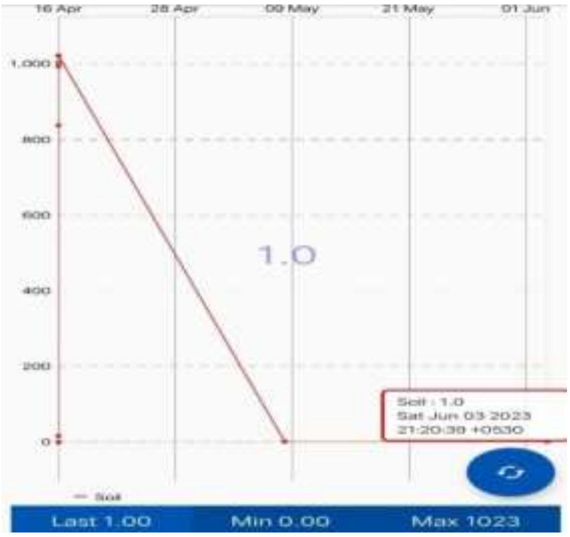


Graph 4.1:Temperature sensor data

4.2 Humidity Senor:

Graph 4.2:Humidity sensor data

4.3 Soil Moisture sensor



Graph 4.3: Soil moisture sensor data

4.4 LDR Sensor:

Graph 4.4:LDR sensor data

	A	B
1	Crop	Label
2	Black Gram	0
3	Capsicum	1
4	Carrot	2
5	Cinnamon	3
6	Corn	4
7	French Beans(F	5
8	Gooseberry(Amla	6
9	Jowar	7
10	Mustard seeds	8
11	Onion	9
12	Potato	10
13	Rice	11
14	Soybean	12
15	Tea	13
16	Tobacco	14
17	Wheat	15

Figure 4.1: Machine learning output

V.CONCLUSION:

The system as a whole provides automated farming techniques that reduce labour demands on farmers. It boosts agricultural yield with less input from farmers in terms of both time and money. Upper side is beneficial for smaller farms because of the high cost of deployment. Graphs are not helpful for evaluating the present or foreseeing potential outcomes. The environment may be managed with the help of humanoid software, which is optimised for fast access to all field components. Mathematical programmes that study historical weather and predict future patterns often make use of temperature and humidity variables.

REFERENCES:

[1] 2019 IEEE International Smart Cities Conference (ISC2), pp. 555–558. V. M. Larios, R. Michaelson, A. Virtanen, J. Talola, R. Maciel, and J. R. Beltran, "Best practises to develop smart agriculture to support food demand with the rapid urbanisation trends in Latin America," doi: 10.1109/ISC246665.2019.9071648.

[2] M. R. M. Kassim, "IoT Applications in Smart Agriculture: Issues and Challenges," 2020 IEEE Conference on Open Systems (ICOS), 2020, pp. 19–24, doi:10.1109/ICOS50156.2020.9293672.

[3] "Smart Field Monitoring using ToxTrac: A Cyber-Physical System Approach in Agriculture," 2020 International Conference on Smart Electronics and Communication (ICOSEC), 2020, pp.723727,doi:10.1109/ICOSEC49089.2020.92152
82.

[4] "IOT Based Smart Agriculture System," International Conference 2018, G. Sushanth and S. SujathaAhmad and K. Pothuganti, "Smart Field Monitoring using ToxTrac: A Cyber-Physical System Approach in Agriculture," 2020
International Conference on Smart Electronics and Communication (ICOSEC), 2020, pp. 723-727, doi: 10.1109/ICOSEC49089.2020.9215282.

[5] G. Sushanth and S. Sujatha, "IOT Based Smart Agriculture System," 2018 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 2018, pp.
1-4, doi: 10.1109/WiSPNET.2018.8538702.

[6] G.Kavianand, V. M. Nivas, R. Kiruthika and S. Lalitha, "Smart drip irrigation system for sustainable agriculture," 2016 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR), 2016, pp. 19-22, doi: 10.1109/TIAR.2016.7801206

[7] Muniasamy, "Machine Learning for Smart Farming: A Focus on Desert Agriculture," 2020 International Conference on Computing and
Information Technology (ICCIT-1441), 2020, pp. 1 - 5 , d o i : 1 0 . 1 1 0 9 / I C I T 1 4 4 1 4 7 9 7 1 . 2 0 2 0 . 9 2 1 3 7 5 9 .

[8] M. Kalimuthu, P. Vaishnavi and M. Kishore, "Crop Prediction using Machine Learning," 2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT), 2020, pp.
9 2 6 - 9 3 2 , d o i :
10.1109/IC SSIT 48917.2020.9214190.

[9] P. Samuel S., K. Malarvizhi, S. Karthik and M. Gowri S.G., "Machine Learning and Internet of Things based Smart Agriculture," 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS), 2020, pp. 11011106,doi:10.1109/ICACCS48705.2020.90744
72.

[10] In Jalandhar, Punjab, at the KCL Institute of Management and Technology, Anand Nayyar is an assistant professor in the department of computer applications and IT. Er. Vikram Puri, an M.Tech. (ECE) student at the G.N.D.U. Regional Centre, Ladewali Campus, Jalandhar, has proposed the use of a "Plug and Sense"-based Smart IoT Agriculture Stick.

[11] Fertilisers Usage in Agriculture and Crop Prediction Using ML Techniques was proposed by
Sravan Kumer, Assistant Professor, School of Computer Science and Engineering (SCOPE), Vellore Institute of Technology (VIT), Vellore, Tamil Nadu, India.

[12] Vinith Kannan, Akash Raj N., Balaji Srinivasan, Deepit Abhishek D., and Sarath Jeyavanth J. Agroautomation system based on AIoT and using machine learning algorithms the requirements and requirements of a large-scale agricultural automation system.

[13] VijayRajpurohit Crop Yield Prediction Using Machine Learning Techniques was proposed by Ramesh Medar. Agriculture is a sector that has a significant impact on the economy of our nation. The 5th IEEE International Conference on Convergence in Technology (I2CT) will take place in 2019.

[14] Subhadra Mishra, Debahuti Mishra, and Gour suggested Applications of Machine Learning Techniques in Agricultural Crop Production at Hari Santra Siksha Anusandhan University in Bhubaneswar, Odisha, India. This methodology is brand-new for managing agricultural crop production.

[15] Vijo T. Vargese Kalyan A status quo of WSN systems for agriculture was proposed by Sasidhar and P. Rekha. Wireless sensor networks have completely changed mobile computing during the past ten years. IEEE Xplore was updated on September 28, 2015.