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An Analysis of the Condition of the Farm Environment Being Monitored in Real Time

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Abstract—As a direct result of an increase in population all over the world, one of the most significant challenges that is now being faced is one that concerns the accessibility of food for all of the people who currently reside on the planet. These issues need to be solved by adopting creative approaches in order to enhance the capacity of the soil and guarantee the safety of natural resources. The solutions to these challenges may be found in the following sentences. The accessibility, in real time, of critical agricultural metrics including moisture, temperature, weather, crop diseases, and water management, as well as the provision of predictive actions in response to shifts in parameters, may be of a great deal of aid in resolving these challenges.. This assistance may offer a great deal of assistance in dealing with these challenges because it may offer a great deal of assistance in dealing with these challenges. This aid may offer a great deal of assistance in overcoming these challenges because it may give a great deal of support in overcoming these challenges. Consequently, it may give a great deal of assistance in overcoming these challenges. These elements include the quantity of moisture that is now present, the temperature, the prevalent climatic conditions, crop diseases, and the manner in which water management is carried out. The Internet of Things (IoT) is a new technology that has a considerable amount of potential to carry out and succeed in its amazing function in almost every industry. The Internet of Things, often known as IoT, is a network that is made up of actual physical items that are capable of establishing their own networks. The development of Internet of Things (IoT)-based intelligent farming is gradually but certainly gaining traction in industrialised countries. Both the manner in which agricultural production is carried out as well as the practise of precision agriculture are altered as a result of this. Because of this, the quantity of resources that are being wasted, such as water, fertilisers, and operating costs, is decreasing as a direct result of this. Because clever miniaturised sensors, processors, and communication technologies are now readily available at affordable prices, Internet of Things-based intelligent farming is now a practical possibility. In addition to that, some advancements have been made. In this study, we will investigate the most recent articles that have been published in the field of IoT-based agriculture between the years of 2015 and 2020. This section begins with a discussion of the most current research, with particular attention on its breadth and methodologies; this material is then displayed in a table, and then discussion and analysis follow. The objective is to build a system that can be used by future academics as a starting point in their quest of a system that comprises of a single standard expert and a totally autonomous aid system. The platform that will be created will be used as a jumping off point..

Keywords—
SmartFarming;Sensors;Cloud;Microcontroller;MachineLearning

I. Introduction

Farming is one of the oldest professions in the history of humankind, and it is also possibly one of the professions that is seeing the most change right now. Farmers are currently up against challenges that have never been seen before. The agricultural sector is under a significant amount of pressure to increase food production as a result of a number of factors, including the rise in global population rates, shifting dietary needs, resource limitations, climate change, and increased economic competition. It has been observed that throughout the course of the most recent few decades, there has been a reduction in the total area of agricultural land that is utilised for the production of food. In 1991, there were around 19.5 million square miles of arable land across the globe, which represented 39.47% of the total land area. In 2013, there were approximately 18.6 million square miles of arable land, which represented 37.73% of the total land area [1]. The widening gap between the amount of food that is available and the amount of food that is demanded is a source of increased concern as time goes on.

To our great relief, recent developments in technology have made available to the agricultural industry innovative strategies for addressing this issue on a global scale. The Internet of Things (IoT) sensors and big data analytics are presenting chances to reinvent outmoded farming practises, which will result in processes that are more cost-effective and will produce bigger amounts of food while using less resources. An Internet of Things (IoT)-based smart farming system is developed in order to automate the irrigation system and monitor the agricultural area with the help of sensors. The end objective is to simultaneously reduce water use while transitioning from traditional agriculture to smart agriculture, also known as Precision Agriculture (PA), which is based on automation and Internet of Things technologies. The Internet of Things enables a wide variety of applications with a focus on agricultural. These applications include those that enable irrigation decision-making, monitor crop development, and many more.

Farmers are able to check on the condition of the field whenever they want and from wherever they are. In this article, a number of modern Internet of Things (IoT)-based smart agricultural system solutions are investigated and presented. With the intention of presenting readers with a condensed review of current advancements in the applicable sector in order for them to comprehend IoT-based smart farming, this article will focus on:

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II. LiteratureReview

[2]uses IoT to automate agriculture. Monitoring environmental conditions helps produce effective crops. This study considers field temperature and humidity. Air humidity sensors detect water. The CC3200 single chip, in addition to temperature (TMP007) and humidity (HDC1010) sensors, are utilised in the system. The CC3200 is a quick and inexpensive programmable Wi-Fi MCU that enables complete Internet of Things development.. If sensor detects aberrant reading, it sends farmers temperature and humidity data. This chip's camera sends MMS photographs to farmers, who then take action.

[3]Uses field-deployed LM35 temperature and soil moisture sensors to monitor water additions. [3] suggested using LM35 temperature and moisture sensors, RPi 3 model B, IC 3208 converter, relay, and buzzer. Soil moisture is fixed at 2.4v, although crops vary. If the reading is below 2.4v, the soil is dry and the water pump is activated. Wet soil turns off the engine. Farmer's mobile/PC can access sensor data via the cloud. The mechanism let the farmer control the water pump on/off.

[4]aims to reduce water, labour, and productivity losses. Moisture sensor gives Arduino soil moisture data. Moisture sensors measure soil moisture. It uses open and short circuits. When dry, the circuit is open; when wet, it closes. Wi-Fi module sends sensor data to cloud. Arduino uploads moisture sensor data to cloud through Wi-Fi. Crop needs determine threshold. Moisture verified against threshold. Crop thresholds vary. Pump turns on if moisture is below the standard value. This saves water.

[5]Proposed a smart IoT stick with temperature and moisture sensors to give farmers real-time sensor data on portable devices. The study in [5] provides cost-effective productivity solutions. The Arduino Mega 2560 stick with moisture and temperature sensors is powered by solar panel and battery (2200mAh; 11.2V). As soon as the stick is placed in a field, the ESP8266 Wi-Fi module starts sending live data to the cloud. Smartphones, tablets, and laptops may access cloud data. Cloud-based sharing lets experts access the data. The setup helps farmers improve productivity and food production by giving exact live feed of ambient temperature and soil moisture. Live Agriculture fields show data feed accuracy of 99% with the suggested approach.

[6]Another study monitored soil moisture, temperature, and humidity in real time to reduce water usage and optimise environmental factors WSAN, cloud, and user application comprise the system. WSAN has sink, sensor, and actuator nodes. ZigBee uses IEEE 802.15.4 for communication. GPRS boards send and receive irrigation orders from the cloud. Sink nodes are network controllers, whereas sensor and actuator nodes are routers or ends. Cloud distributes, stores, and detects irrigation events. User application displays network node location and sensor data.

Remote soil feature monitoring increases crop production. [7]uses chemical soil characteristics to innovate. examined soil pH, temperature, and moisture. Smartphones characterise soil in real time. Solution pH indicates acidity or alkalinity . PH values range from 1-14. A soil with a PH value less than seven is acidic, whereas a higher number is alkaline [8]. DS18B20 sensors measure temperature and antimony electrodes pH[7]. System is STM32 Nucleo-based. The STM32 Nucleo board lets users develop prototypes or smart systems. Bluetooth sends sensor data to a client's phone so they may apply fertiliser immediately. The suggested technique can maximise yields per acre while reducing fertilization use and crop failure risk.

[9]presents a comparable effort with different infrastructure technologies. Monitoring soil pH, temperature, and humidity. Farmers grow crops using sensor data. Sensors include pH, LM35 temperature, and HH10D humidity. The system recommends crops based on soil and environmental conditions and monitors them. MCP3008 microcontroller converts analogue sensor data to digital. GPIO connects MCP3008 with ARM11. Wi-Fi sensor data to server. Threshold levels optimise sensor values, and predetermined values automatically turn on and off water supply and fertilization.

Farmers may use a smartphone app to monitor soil humidity, wetness, temperature, and water level using NodeMCU, an open-source IoT platform, uses Lua programming and sensors to measure environmental factors. LM35 reads temperature, while water level sensor monitors reservoir water level. The farmer receives the information when the water level drops below a threshold. Arduino controls all sensors. ThingSpeak develops sensor data applications. It involves data collection, processing, receptions, applications, and modules [10]. Arduino connects all sensors. Sensors transmit real-time environmental data to the organizer. Then farmer gets detailed cloud platform information. Time-stamped cloud data helps predict crop conditions and is accurate.

[11]designs a smart greenhouse system to remotely monitor crucial factors. Temperature, humidity, moisture sensor, CO2, and light intensity are important. Greenhouse windows and doors are opened or closed based on soil moisture measurements. Cloud receives sensor data. Farmers may access cloud-stored sensor data anytime. The farmer may remote-control the water pump and mechanical door/window.

[12]Studies crop watering precision. The system monitors and analyses humidity, temperature, moisture, and ultrasonic sensor to supplement water. The amount of water in the reservoir is tracked using ultrasonic sensors. PX28015 ultrasonic sensors, a soil moisture sensor, DHT22/AM2302 humidity and temperature sensors, and an ESP8266 microcontroller are all components of this system. Sensors that are attached to microcontrollers collectively measure water.. The system calculates daily water needs. The reference value is established. When water is low, motor pump turns on/off. MQTT notifies server and mobile.

The management of water on agricultural land is being automated by 13. This Internet of Things system is comprised of a moisture sensor that is based on an ATMEGA328P Arduino Uno, as well as a relay, motor, and Adafruit server. NodeMCU sends microcontroller sensor readings. Adafruit server stores sensor data. The moisture sensor voltage matches soil moisture. The microcontroller (MC) will activate the water pump if the moisture level in the soil is less than 5v. Water is controlled with automated irrigation in[13].

Farmers may better manage their time, costs, and energy with the assistance of real-time data and other external factors. IoT and WSN are the two main components that go into making a smart system [14]. The technique that has been suggested involves looking at the temperature, humidity, and moisture content of the soil, in addition to the weather history from the prior ten days. During the process of developing the KIANI sensor nodes, SIXAB and IZU-WSN Research Lab employed the Texas Instruments CC1101 Low-Power Sub-1G, the R Transceiver Processing unit, and the Arduino Nano. These were all pieces of equipment manufactured by Texas Instruments. The primary component is run by a 3.7-volt Li-ion battery that has a capacity of 1200 mah. The RPi3 is in charge of collecting data from sensors and sending it to servers where it is processed. Both websites and mobile applications can get data from servers that are hosted elsewhere. Because distant data is accessible, users are able to make quick decisions based on the information provided by the system..

[15]A system that monitors temperature, humidity, soil moisture, and animal activity, such as cows and dogs that are known to harm fields has been proposed. This apparatus monitors the temperature, the moisture level, and the movement of animals in order to preserve the plants and the fields. The farmer will be notified of any inconsistencies. The system consists of an Arduino Uno R3, an ESP8266 Wi-Fi module, a GSM module, and an LM35 sensor for measuring temperature, humidity, and soil moisture. An Android app with a user-friendly UI is also developed. Data may be sent to the cloud from Arduino

gateways by using either Wi-Fi or GSM. While Wi-Fi is responsible for keeping the cloud data up to date, GSM-based communication utilizes 2G, 3G, and 4G services to send alert messages to the mobile phones of farmers. Farmers have the ability to control the watering and growing season of their plants. Farmers may use the Android app to set their irrigation plans according to the season and receive warning alerts. The farmer needs to make a decision based on real-time data and weather reports on whether or not to turn the water pump on or off.

In [16], methods of modernization are utilized to increase agricultural production while also lowering the amount of water consumed. Robots are utilized in this system for the purposes of weeding, spraying, detecting moisture, identifying birds and animals, managing warehouses, and performing intelligent irrigation. [16]offers a PC, node1, node2, and node3. Every node has its own set of sensors and other devices. The GPS of Node 1 is capable of being programmed or controlled by the computer. Spraying, animal frightening, and weeding are on the to-do list. It also contains cameras, sirens, cutters, and sprayers in addition to ultrasonic obstacle sensors. Node 2 is a storage facility that includes a microcontroller for AVR, a room heater, a cooling fan, a motion sensor, a light sensor, a humidity sensor, and a temperature sensor. DHT11 is an inexpensive digital sensor that measures temperature and humidity., detects humidity and temperature and turns on the cooling fan or water pump to maintain temperature. Node3 is a mobile-controlled irrigation node that screens and controls water pumps. ZigBee Modules connect nodes 1 and 2. The mechanism is manual and automated. In manual mode, users turn on and off appliances, while in automated mode, threshold values regulate them. Smart warehouse systems control temperature, humidity, and theft. An algorithm that maintains temperature and soil moisture in a microcontroller can manage water quantity.

III. Discussion and Analysis

[2] utilizes MMS technology to communicate farmers field temperature and humidity images. MMS transmissions cost more. Automatic decision support system smartens system. Additionally, analytics-based autonomous watering might make it smarter and maximise IoT potential.

Monitors water supplement using soil moisture and temperature sensors. Historical data controls water quantity. Crop thresholds vary. IC3208 acquires data. Wi-Fi gateway RPi sends sensor data to cloud database. The fully automated system provides real-time field soil temperature and moisture data.

This single-sensor system reduces water and labour waste and boosts production. Add humidity, pH, water level, weather monitoring, and GPS technology to the system in [3][4]. Unspecified data transmission resolution. ML will smarten and automate the system.

[5]presents an IoT-based smart stick featuring Arduino Mega 2560, moisture sensor, temperature sensor, solar panel, and battery (2200mAh; 11.2V). Users manually act on real-time data. Adding sensors like pH for fertilization, PIR for microbe movement, CO2 for air quality, and GPS for field sector identification can improve stick usefulness. ML-controlled water pumps and urea supplements.

[6]WSAN-based plant irrigation assessment system. ML can make the system smarter.

In[7], smart phone users receive temperature, humidity, and soil pH updates through indoor IoT farming. Bluetooth sends sensor data to client's phone. Again, users chose how to perceive instant data. Field fertilization and watering may be the activity. The technology solely covers indoor farming and lacks automated decision assistance.

The pH, temperature, and humidity of the soil are all measured by [9]. The structure is improved thanks to the water level and GPS sensors. The activity pattern of turning on and off actuators in response to changing environmental conditions might be learned by machine learning, which could then suggest crop monitoring.

An application for mobile phones in [10] offers real-time information on the soil's temperature, humidity, and amount of water. It's possible that machine learning may automate suggestions and projections for farmers based on past data.

A smart infrastructure for greenhouse agriculture based on the Internet of Things [11]keeps an eye on the moisture in the soil, as well as the temperature, CO2, and light levels for the bell pepper plants. The use of analytical design can result in more accurate early prediction.

The way in which water is replenished in [12] makes the most efficient use of the water reservoir. Again, water management alone. Increase the number of sensors and make use of big data to identify patterns of activity and automate responses to shifts in environmental parameters.

The management of water on agricultural land is being automated by 13. The technology was developed for use in a regulated setting located inside. Consequently, implementation in the actual world will highlight design flaws. The management of water, monitoring of weather, humidity, and temperature, as well as machine learning, will make it more intelligent. It may be possible to enhance water management by utilising droplets, sprinkles, and smart drains rather than just switching the water pump on and off[13].

[14]a wireless network-based smart framework with sensors for soil moisture, humidity, and temperature together with an RPi 3 gateway has been recommended. Big data analytics, when used to the automation of decision-making, would be a more effective method than [14], which only depends on the input of farmers.

[15]Advised a method in which farmers may schedule irrigation for their crops by using an android application on their mobile devices. The technique that is being described currently calls on farmers to respond to system messages that are sent to their smartphones, but it has the potential to become totally automated depending on the manual practises of farmers.

[16]Weeding, spraying, measuring moisture, frightening animals and birds, smart irrigation with smart control, and smart warehouse management (temperature, humidity, and theft detection) are some of the tasks that may be accomplished by the proposed remote-control robot system. ZigBee is capable of communication. The GPS-based remote control system may benefit from the application of machine learning [16].

This research showed that several methodologies have been used for a specific goal and improved, but IoT-based agricultural inclusion with big data has not yet been completely used. IoT and big data might solve global food, water, and resource problems. Thus, this combination can produce expert systems for farmers and novices that maximise quality production. This would also build a community where users can share their successes by deploying their expert models, boosting farming. This study is meant to help future researchers innovate.

IV. Conclusion

This article examines Internet of Things (IoT) farming, which many researchers have adopted accompanying technology implementation, and lists its benefits and suggestions for development. Farmers in impoverished regions confront issues such as accurate and automated irrigation, fertilization to boost yields in order to feed an expanding world population on a shrinking amount of arable land, and minimizing human intervention and effort. In conclusion, Internet of Things (IoT) farming has not yet been fully utilized to deal with the difficulties of providing food to a growing global population while at the same time reducing the quantity of arable land, which would minimize the need for human participation and labor. This would minimize the need for human involvement and labor. The combination of agricultural technology based on the Internet of Things (IoT) and large amounts of data has the potential to produce a worldwide solution that is applicable to both indoor and arable farming. In the realm of farming that is based on the Internet of Things, there is a tremendous expansion potential for one of the most cutting-edge technologies. It provides us with a new method to acquire vast data to analyse in depth and automate the entire agricultural system for improved yields in both quality and quantity by combining different types of technology, such as sensors, embedded computers, current networks, wireless communication, and distributed information processing. This allows us to improve crop yields in both quality and quantity.. This article's objective is to provide researchers with a concise assessment of the most current strategies and technological advancements that have been made in IoT-based farming in the hopes that they will be able to develop a worldwide solution for IoT-based farming.

References

[1] M. A.-U. M. S. Z. M. A. &. A. E. Ayaz, "Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the fields Talk,"*IEEE Access,* p. 7, 2019.

[2] H. A. a. J. M. Prathibha S., "IOT Based Monitoring System in Smart Agriculture,"*International Conference on Recent Advances in Electronics And Communication Technology,* pp. 81-84, 2017.

[3] R. N. R. a. B. Sridhar, "IoT based smart crop-field monitoring and automation irrigation system,"*2018 2nd International Conference on Inventive Systems and Control (ICISC),* pp. 478-483, 2018.

[4] A. K. T. U. Dweepayan Mishra, "Automated Irrigation System-IoT Based Approach,"*IEEE,* 2018.

[5] V. P. Anand Nayyar, "Smart farming: IoT based smart sensors agriculture stick for live temperature and moisture monitoring using Arduino, cloud computing & solar technology,"*The International Conference on Communication and Computing Systems,* 2016.

[6] N. Sales, O. Remédios and A. Arsenio, "Wireless sensor and actuator system for smart irrigation on the cloud,"*IEEE,* 2015.

[7] W. I. V. K. Abdullah Ahmad, "An IoT based system for remote monitoring of soil characteristics,"*International Conference on Information Technology (InCITe),* 2016.

[8] C. Taylor, The Kingfisher Science Encyclopedia, New York: Kingfisher., 2000.

[9] N. A. a. J. D. a. M. D. a. V. A. Janani, "IoT based smart soil monitoring system for agricultural production,"*2017 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR),* pp. 209-214, 2014.

[10] N. S. H. N. P Lashitha Vishnu Priya, "Smart agriculture monitoring system using IoT,"*International Journal of Engineering & Technology,* 2018.

[11] J. D. M. Y. B. S. Pallavi, "Remote sensing and controlling of greenhouse agriculture parameters based on IoT,"*International Conference on Big Data, IoT and Data Science (BID),* 2017.

[12] K. Pernapati, "IoT Based Low Cost Smart Irrigation System,"*2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT),* pp. 1312-1315, 2018.

[13] D. B. M. Priyanka Lahande, "IoT Based Smart Irrigation System,"*International Journal of Trend in Scientific Research and Development,* pp. 359-362, 2108.

[14] A. S. Farzad Kiani, "Wireless Sensor Network and Internet of Things in Precision Agriculture,"*International Journal of Advanced Computer Science and Applications,* 2018.

[15] S. S. G. Sushanth, "IOT Based Smart Agriculture System,"*2018 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET),* pp. 1-4, 2018.

[16] P. D. R. S. K. Nikesh Gondchawar, "IoT based Smart Agriculture,"*International Journal of Advanced Research in Computer and Communication Engineering,* vol. 5, no. 6, pp. 838-842, 2016.