Survey: IOT Methods adopted in agriculture field to monitor crop growth

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Abstract-*This article presents the use of IOT in agriculture to observe crop growth. This is new emerging technology for the field of agricultural observation in remote locations. Changes in climate, irrigation and also information on fertilizers. Advancement in agriculture in the field of efficient use of available resources. Mainly nutrient concentration and soil moisture sensor, humidity and temperature are used to measure the data by means of a sensor.NPK water measurement sensor followed by a sprinkler for effective water use. Various technologies have adopted Raspberry pi for storage temperature, humidity, soil moisture and cloud used to store data for analysis and fuzzy logic applied to nutrient level monitoring. The survey shows that it is very useful to improve the level of production, nutrients and correct use of water in monitoring agriculture.*

Key: NPK, nutrients, fertilizer

I INTRODUCTION

India agriculture is a fundamental source of income. In the agricultural sector, few decades of expected crop yields are much lower. In the current situation, the increase in agricultural crop production needs to be improved. Owing to environmental factors such as unconditional climate, temperature variation, humidity, low soil moisture content, excessive use of fertilizer, pesticide yields have not been obtained. As a result, the intelligence methods adopted provide for the quality of yield and the minimum utilization of resources. Using the IOT system and cloud computing, we can observe all climate conditions from agricultural field time to time and intimate to farmer to take action to increase crop yield and production. These methods reduce labor costs and increase production [1].

This is also easy to evaluate agricultural data such as soil moisture, fertilizer information and pesticide identification if precision farming methods are adopted. The Internet of Things is a revolution in the agriculture sector , allowing farmers to tackle a wide range of water challenges.

The WSN (Wireless Sensor Network) consists of a space network. Autonomous Distributed Sensors They are capable of physical monitoring Means such as temperature, sound and pressure. Also, I think that Sensors are collaboratively transferring their data to the main network location.

Linear regression and support vector machines are used to predictive analysis and classification. Machine learning approaches suggested by the neural network applied for weather forecasting and the alternative cost classification algorithm adopted for selecting better crop comparison will be used for weather forecasting techniques The artificial neural network will produce better output results for each selected weather parameter.

Product quality and productivity. Pathogens are controlled by fungicides in plants [8].Decision support could be used to detect diseases in plants. This climate-based method is used to identify blight diseases in the event of infection. Frequently collecting temperatures per day and hour basis, average baseline values considered for the identification of disease rates affected by the plant.

Each crop depends on the soil content. The level of nutrients l in the crop, NPK, ph, soil moisture based on this crop parameter is determined to take maximum yield. Some factors are used to determine the selection of crops in agriculture. Regression methods and data mining statistical methods are currently being used. Another method is machine learning, which is used for crop selection, yield prediction, weather monitoring and automation [1].

Weather condition: different crops are cultivated in India. Every crops their own parameter some crops are required maximum temperature others are minimum and humidity and rainfall.etc crop is determined in this condition.

Water: crop decided based on proper irrigation is required for a crop. To avoid wastage of water and unless it rains efficient usage of water increase yield.

Soil: soil is major for every crop. First collect soil parameter like NPK level and soil ph and soil carbon, soil moisture decide crop for better growth, production and yield.

II LITERATURE SURVEY

A] *Improved efficiency using IOT:* IOT devices are nowadays very important in collect data, and various agriculture product information through intelligence method without interaction of human across different remote area. Wireless network are used to monitor crop, node mounted different place of location to access remote data[11]. Water management and pesticide, climate changes monitored through wireless network solar power used in sensor network.

B] *Weather based crop:* this author presents every crop in India based on weather condition. Good yield can achieved using climate data analysis soil condition [1]. Also crop is recommended based on weather condition.

C] *Pollution monitoring:* Because of environmental pollution and industry miss management, miss treatment environment is polluted it also affect to human lifestyle [13]. It identifies damages in ecosystem by using preventive measures.

D] *Agricultural parameter:* traditional water management is lack of water management due to environmental condition and population increment. this situation production level also crop yield decreased effective usage of water to safe crop. Due to effect of environmental factor and climate are significantly changes [7].

E] *Microclimate:* Due to climate changes lack of variation in cultivation because of farmers are unable to get crop quality and quantity because of damages in crop[10].IOT system are used to monitor indoor climate changes through collecting data from database.

F] S*mart agriculture and form:* this article presents use of IOT and wireless sensor network usage. Available sensor is utilized for intelligence agriculture like crop monitoring; irrigation, identifying pesticides, and soil moisture are enlisted. Many industries are adopting IOT methods to improve statistical approach. Main approach of this paper is irrigation, crop growth pest detection are listed [3]. IOT provides a accurate and proper methods in different agriculture domains. The

article presents several techniques and methods adopted in IOT for horticulture purpose. Also presents issues in security level [4]. This paper presents water volume sensor, temperature sensor, humidity sensor, soil moisture sensor to monitor crop growth[14].

G] *Predictive analysis:* iot just like technology and data can be extracted through different node. Cloud computing methods are used to analyze data using predictive methods. this precision agriculture applied for managing production of crop, increase quality and provide nutrition in proper order due to environmental impact from pesticides[12].

H] *Precision Agriculture:* wireless technology Leeds and achievement in agriculture field. This paper presents monitoring paddy crop and increasing accuracy level also automation methods provides in weeds in crop [16].

I] *Data analysis in farm:* different methods are adopted like sensor, web application and data mining technique to analyze data and compare stored data like temperature, soil moisture for development of crop[17].

J] *Water management:* now a day's water is main resource available from nature for human. Increase in population effective usage of water for agriculture purpose is important. If water flow in unconditional way constitutes decrease in crop yield [18].

K] *Plant disease:* this article represents leaf diseases and nutrients imbalance. Also effective   usage of fertilizer is used to avoid unwanted effect to crops.

L] *Smart irrigation:* this article presents intimation for farmer to provide schedule of irrigation and remote monitoring of data. Main intension of this paper low cost and portability, making it suitable for greenhouse, farms, etc.

M] *Disease prevention in precision agriculture:* decision system created for finding disease in   potato climate condition can be recorded through weather forecasting station then forward information to IOT framework DSS system is good for finding environmental impact on precision agriculture [8].

N] *Crop monitoring:* advancement in agriculture field effective utilization of available resources. Mainly concentration on nutrients and soil moisture sensor, humidity and temperature are used to measure data through sensor.NPK

sensor water measurement followed sprinkler for effective usage of water [15].

O] *Automation in agriculture:* automation in agriculture creates new trends in every country. Whenever population increases it also required food requirement. In this case farmer not able to provide as per requirement because of fertility issues and pesticides and followed by insecticides. Finally provides soil fertility information.

P] *Protocol methods in agriculture:* IOT, cloud computing and machine learning methods are emerging in agriculture, transportation and environmental factors.

Q] *NPK measurement:* IOT system used to monitor NPK content in soil to measure nutrients level present in soil. Fertilizers information provide to farmer through alert message after reading NPK in soil. it useful for agriculturist to avoid more usage of fertilizer[5].

R*] Smart Agriculture field:* farmer need to monitor field in frequent level. Crop loss due many conditions like temperature and mismanagement of soil moisture [21]. Iot is progressive technology and it is better in enhancement of computing and interchanges. Utilizing present day advances can control the cost, support and checking execution. Exactness farming sensor checking system is utilized incredibly to quantify Agriculture related data like temperature, soil PH, soil nourishment levels, and water level [23]. Horticulture segment in India is decreasing step by step which influences the creation limit of environment. Farmers to take appropriate decision in entire cultivation life cycle [26]. Climate observed from few year gradually changes. it also effect in agriculture field. to monitor such changes in agriculture field adopting smart agriculture.

S] *Precision agriculture:* due to frequent changes in climate to avoid inefficient use of water. real time supervision and automatic system are required to better crop and bad weather condition intimation is required[22].

T] *Monitor of soil and crop yield:*
The specific developments in various domains most real time systems are making the use of emerging technologies. However, the application of these technologies is part of the field of Farming remains a demanding task. Main goal of this author suggested that crop growth and soil. it provides complete information about filed data is extracted through sensor storing sending in formation to farmer[24]. IOT

provides platform in agriculture to provide smart agriculture. Main task of this author to provide better yield for farmer[25].

U] *Crop monitoring using GSM:* main concept of this paper avoids environmental unconditional effect for crop maintains good balanced conditional measures. Eliminate manual method provide some intelligence methods to monitor crop. Main concentration on vegetables inside green house to improve production, quality and quantity in green house.

V] *Irrigation using Zigbee:* cloud computing usage eliminates manual method implementing intelligence system. Cloud computing implements practical application to monitor ecosystem in systematic way. From sensor node receive data from form field stored in repository. Main use of this system to identify level of water present in ground.

III RELATED WORK

Machine learning approach it proposes neural network applied for weather prediction, and alternate forest classification algorithm adopted for select better crops. Comparison will be done weather forecasting technique artificial neural network, which shows better performance results for each selected weather parameters [1].
Weather data set considered from last 5years:

- Soil Ph.
- Soil fertility.
- Soil type.

Result: this paper presents weather based and soil parameters are considered for selection of crop for agriculture land. Comparison technique provides a accurate result in prediction. ML/DL machine learning and deep learning methods are adopted for communication with device and security based intelligence system [2].As shown in figure 1 this device used to monitor intrusion detection, this method is good for communication among components to observe conditional and unconditional behavior. Tells stuff you don't need .ML/Dl methods is useful in identifying attacks in early it can improve the efficiency of IOT and provides clear line between all devices.
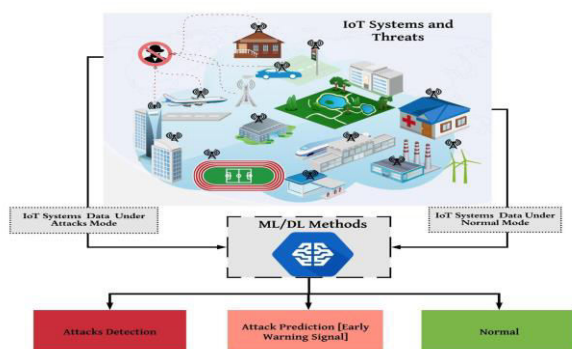
Figure 1:ML/Dl in IOT security[2]

Result: IOT has many technologies like communication through remote place, data analysis and wireless communication, cloud computing these technologies requires a security in global level.

Ziggbee and LEACH and wifi module to store data for remote sensor. Collect data from senor data is monitored by using machine learning technique crop index is created to analyze and to take better yield.WSN (wireless sensor network) and solar energy are used to monitor different environmental condition and water management [11].it presents different sensor are inserted in many location like distributed pattern collect data from different sensor send the data to server using IOT gateway. Bluetooth model and raspberry-pi methods are used for air pollution. Result in this model used to improve the ecosystem monitoring water soil and water pollution.

Cuckoo algorithm adopted for supply of water at any situation. Temperature, ph content and turbity, moisture data were collected using IOT and cloud. it provide soil condition can be measured automatically and avoid wastage of water. Farming accuracy [7].

Climate system different sensor like temperature and humidity and CO2, soil moisture, light sensor used. Pictures are captured data send to database server data analyzed and send to farmer. and it demonstrates this method electronic sensor are used to monitor indoor climate control like air water and humidity capture image and process image for analyze present situation using camera[10].

In smart horticulture wireless sensors, UAVs, Cloud-computing, communication technologies are used. Main intension of this paper identify crop and maintain nutrition level increase production maintaining good relationship with growers and borrowers and suppliers [3].In predictive methods linear regression and support vector machines are used to predict and classification methods [12]. These methods applied only for potato and tomato to avoid effective usage of pesticide and increase growth of crop in diseases life cycle.

Precision horticulture Raspberry pi and Bluetooth methods are adopted different images are taken and preprocessed,

different soil texture considered and SVM methods are used differentiate paddy crop and weeds. [16].

Data analysis in agriculture field digital box and web master and smart phones used in this paper. Digital box used for collect information from IOT sensor displayed on web page and send alert to farmer about their field. Data mining technique are used to compare temperature is required for lemon crop for better growth [17].

Water management results in water management are need for every aspect like human, animals and plants. And proper usage is done by adopting controlled way to get good yield.

Smart farming it presents cloud computing, big data storage and analytics role presented .encryption algorithm and key distribution policies, identity authentication, data flow control are discussed. Most of researcher is adopting IOT technology. Monitor agriculture field, increase production, crop growth and environmental condition measurement. This article presents usage of sensor, protocol and other intelligence technology [4].

Identification of plant disease improved genetic algorithm (IGA) optimized feature selection algorithm for ELM classifier (IGA-ELM).this used for classification methods provide 9 to 5% accuracy. This binary classification methods improving prediction accuracy (9,29%) .Statistical methods are adopted. Accuracy level also increased in some extent [20].

Smart irrigation this article presents intimation for farmer to provide schedule of irrigation and remote monitoring of data. Main intension of this paper low cost and portability, making it suitable for greenhouse, farms, etc.

IV ISSUES IN CROP MONITORING SYSTEM

- No crop is decided. data extracting through IOT system and comparison of data not clearly obtained this is very difficult to identify crop yield which parameter is to take better yield and what type of frequency used for different crop.

- Applying IOT and different sensor are used to monitor inside present situation. But this is not applied for particular crop very difficult predict and monitor. Because different crop have different parameter to set and compare data with traditional methods and sensor methods.

- Usage of sensor and IOT component are discussed but algorithm not discussed in order to increase crop growth and maintaining nutrition level not clearly indicated.

- Very large volume of data reading like temperature this data displaying in mobile very complex every hour it stores plenty of data in mobile farmer could not able to understand for initiative measures .
- Solar based system is limited distance and network power very difficult to adopt in large scale. Particular crop not decided in this case very difficult to estimate water for any crop. Fertilizer and pesticide information not clearly mentioned.

ACTION PLAN:

- Identify soil type collect various parameter like soil moisture and nutrients levels and NPK content observed.
- Traditional methods data not compared with intelligence methods. Data analysis will be done in agriculture field farmer to get better quality, production.
- In this paper IOT platform not implemented collecting different set of images to analyze immediately take proper decision for crop.
- Avoid wastage of water now a day's some regions crop yield is very low because of less rain.
- Better to implement prediction module to get better yield observe environmental factor. Irrigation automation.
- The capabilities of such a system could be extended through the introduction of various machine learning algorithms.
- To guide a futuristic standardized model for the implementation of a more robust and secure model.
- We can also use the CO2 concentration sensor, the humidity sensor in this system and work with big data in the future.
- Through direct field testing or tested in horticulture plantation. Automated system not developed field monitoring analysis of data prediction methods not yet developed.

- To utilize this energy in smart agriculture with the help of IoT and WSN technologies produce successful results in the field of agriculture.
- For better accuracy of the crop selection system, soil parameters such as the N-P - K soil nutrient ratio and soil temperature can be considered.
- Maintenance cost is high for farmer it should be lesser in price. Current database the board framework may not deal with in a continuous way on the grounds that the started information might be as well much huge in size. IOT based information would be created. data transfer and processing need to improve. Quality of service is required.
- In future This IOT system is not adopted in coca and arecanut take any one of crop better adopt intelligence system to monitor crop.

V This survey presents a novel approach to monitoring different environmental conditions. The overview of IOT technology shows so much growth and reveals a lot of work going on. It is very convenient for plant production and yield. This intelligence network provides substantial temperature and humidity, soil moisture, soil ph, NPK. This monitoring system is useful in the field of agriculture in order to improve production, improve the quality of plant yield. The benefits of IOT using machine learning and regression techniques are discussed in the field of precision agriculture.IOT is expected to deliver a variety of agricultural offerings and benefits.

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