

## E-FARMING USING INTERNET OF THINGS (IOT)

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**Abstract:** In the era of IoT , many devices are connected to one another and huge IoT data is generated. While growing rapidly, IoT has extended its arms towards agriculture fields also. Internet of Things (IoT) enables different applications like crop growth monitoring and selection, irrigation decision support, etc. and also warns about insect attack on crops and also some other unforeseen attacks. The Wireless Sensors Network (WSN) is commonly used to build decision support systems. In this paper we discussed about how well this Internet of Things can be implemented in agriculture field to get the best yield and also to take precautionary measures

### 1. INTRODUCTION

Internet of Things (IoT) is a huge terminology that describes the interconnection of daily life routine through internet. In IoT concept every device or object is connected to each other. These connected device or objects will work without taking any help of humans or human interaction [1, 2]. IoT is referred as network which will work every day with the objects having accurate computing. The accurate objects have increased by combining the objects with embedded system for more interaction. It also connects the device and human being with highly distributed network. IoT is a very broad network which is growing rapidly. Main aim of IoT is to connect the human and device through internet. In this every object is connected or assigned with its own unique identifier so that everyone can access it through internet. This technology is growing rapidly and it is been used in various devices like cars, smart homes, connected wearable, smart cities and connected health care. Basically a connected life. According to Gartner report, by 2020 connected devices across all technologies will reach to 20.6 billion. HP did a small survey in which they estimated the rise of connected devices over the years and the results are surprising. Are we moving towards a fully automated world?

YEAR	NUMBER OF CONNECTED DEVICES
1990	0.3 million
1999	90.0 million
2010	5.0 billion
2013	9.0 billion
2025	1.0 trillion

Source: HP

### 2. WIRELESS SENSOR NETWORK

#### A. Use Of Wireless Sensor Networks In Precision Agriculture

Precision Agriculture has the advantage of providing real time information on variables. As its name suggests, precision farming is accurate both in the size of the growing area and the amount of water, fertilizer, and so on. This technology can isolate a single plant for surveillance in tens or hundreds of square feet. The Wireless Sensor Network system requires a centralized control unit with user interface. The quality agriculture requires a software which has unique model for each geographical area, the intrinsic soil type and the particular crop or plants. For example each land requires some amount of water, fertilizer and pesticide to plant the proper crop and get the best results out of it. Every data to be collected based on the hour, where frequent data doesn't provide additional information which is very helpful. This entire sensor is used in field

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when the crop is growing. These are used to get best results by knowing the weather condition prior. The data collection, material and monitoring application allows for higher yields and lower cost, with less impact to the environment. Each land receives only required element for its particular space with appropriate time and duration. A common agriculture application can be used for large crop area and monitoring.

### B. Sensors

A sensor is a device that detects and gives the portend about the light, heat, moisture, pressure or any one of the environmental action which will harm to the crop. The output is generated which is human readable and transmitted electronically over a network for reading or more processing. Sensors are sophisticated devices which are used to detect and respond to the optical signals. A sensor converts the physical parameter into electrical signal. For example temperature, blood pressure, humidity, speeds, etc. Sensor is used in precision agriculture to monitor and collect the data about the condition of the land. It will check the soil water availability, soil fertility, temperature, plant water status, etc.

### C. Different Types Of Sensors

There are certain features which have to be considered when we choose a sensor. They are as given below:

- Accuracy --The degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard.
- Environmental condition -- Checks the weather conditions such as temperature, moisture etc.
- Range --Checks the distance between the sensors.
- Resolution -- Smallest increment detected by the sensor
- Cost
- Repeatability - The reading that varies is repeatedly measured under the same environment

### D. Types Of Sensor Deploymen In E-Forming

- Temperature Sensor (Lm35)

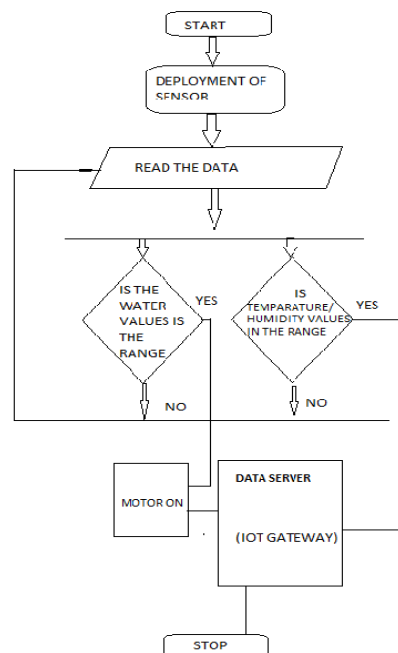
This sensor helps to measure the temperature with an electrical output. It also checks the temperature which is good for the crop. It also gives information about the temperature priory. Temperature sensor gives more accurate results than any other devices like thermostat.

- Humidity Sensor Hr 202

Humidity sensor is used to check water level in the land. This measures how much water is required for the crop. The HR202 is a new kind of humidity-sensitive resistor made from organic macromolecule materials, is is used in hospitals, storage, workshop, textile industry etc. The operating temperature range is from20-95%.

- Rh. Water Level Sensor

Water level floats sensor is also known as float balls, which are spherical , cylindrical in shape. They may also incorporated into switch mechanisms. These are made from flexible material , that are buoyant in water and other liquids.



### 3. INTERNET OF THINGS IN E-FORMING

In this present world the demand for food supply is extremely increased. Governments are helping farmers to use advanced techniques and technology to increase food production. Smart farming is one of the fastest growing module in IoT.

Farmers will get detailed data information from IoT sensors which are placed in the fields and particular area for Sensing the soil moisture and nutrients, controlling water usage and supply of water for plant growth and determining custom fertilizer. The IoT implementation in agriculture field will solve many problems for the farmers.

### 4. APPLICATIONS

#### A. High Tech Farming: Precision & Smart Agriculture

Farmers can use this techniques and technologies to improve the efficiency of their day to day work. for example, farmers can place this sensor in field to get detailed map of both the topography and resources in the area, and also get details about acidity and temperature of the soil. it can also used to get the information's about the climate forecasts to predict whether patterns in the coming days and weeks

Farmers can use their smart phones to remotely get information's and monitor about their equipment, crops, and livestock, as well as obtain stats on their livestock feeding and produce. They can even use this technology to get statistical predictions for their crops and stocks. Farmers can use drones for farmers to survey their lands and generate crop data.

Farmers can connect their tractors to the Internet and has created a method to display data about farmer's crop yields. As like smart cars, self-driving tractors, which makes easy to the farmers to perform other tasks and further increase efficiency.

All of these techniques helps in precision farming, the process of using satellite imagery and other technology (such as sensors) to observe and record data with the goal of improving production output while minimizing cost and preserving resources.

#### B. Smart Farming And Monitoring Using Iot

The fact that most of our farmers lack proper knowledge makes it even more unpredictable. A large part of farming and agricultural activities are based on the predictions, which most of the fail. Farmers have to suffer huge losses and at times and energy they end up committing suicide. Since we know the benefits of proper soil moisture and its quality, air quality and irrigation, in the growth of crops, such things cannot be ignored.

Here we come up with a new idea of crop monitoring and smart farming using IoT. This concept will be a benchmark in the agribusiness due to its reliability and remote monitoring. Here digitalize farming and agricultural activities so that the farmers can check on the requirements of the crops and correctly predict their growth. This concept makes tremendous increase in business to reach new level and also makes more profitable. The implementation of this concept depends upon the awareness among farmers, it can be easily implemented due to its numerous advantages.

*Features:* Introducing the latest technology into the agriculture business and improves better crop production by collecting real-time status of crop and informing the farmers about it.

The Features are:

- SMS Notification
- Valuable information Collection
- Detailed Data Analysis
- Cost effective
- Easy to implement

### 5. CROP SELECTION

#### A. Selection Of Crop Which Is Suitable For The Land

All crops need different atmospheric conditions and land to grow, but it is difficult to farmers to find land and other conditions to get good results in crop growth. It can be done by taking survey for the agricultural land combining the power of artificial intelligence and IoT in unmanned aerial vehicle (UAV).UAV, a small airplane used for the in-flight observation and monitoring that gathers data like- visual, thermal, and air pressure, humidity, the weather condition. This data is really helpful for the farmers to take the decision. UAV helps farmers in getting information on plant height, weed detection, plant-counting, crop health and changes in the plant in different seasons.

##### 1) Making irrigation effectively

Supply of water in the right time and quantity and the right place is the vital role in plant's growth. Water supply in remotely is a big challenges to the farmer, especially the supply becomes more difficult during the shortage of water which leads to damage of crops. Connecting these humidity sensors, water valves and monitoring system, water supply for irrigation can be controlled easily. Humidity sensors easily measure the soil moisture and based on that data, water valves provide water to the field automatically without any human interactions. Also, if there is any leakage in the water pipes can also be recognized easily. All these data can be access and manage to the farmer at distance on the mobile phone itself. In this implementation there will be the least wastage of water, water consumption in the field can be tracked, in drought areas the crop water management could be done efficiently.

##### 2) Know weather forecast informations in advance

Climate and weather having great role in crop production at large scale. Frequent changes in the climate and weather sometimes damage the crops and farmers going to suffer from a great loss. If the farmer knows weather information before they decide plantation of crops. It can prevent many problems in future!!! With IoT farmers would get accurate weather forecast in real-time and based on this information, they can pre-plan the different activities. Also, in case of future contingency, right steps could be taken before to prevent the loss to happen that going to happen in future.

### 3) Evaluate the growth performance of plants

For getting right irrigation facility, perfect weather condition is essential, else plant won't grow well. Constant performance measurement, weather condition and evaluation is necessary, for that regular visit to the field for the farmers will make many time wastage. IoT technology makes this work done from a distance with sensors. Planting of remote sensors would check the soil temperature, air, humidity, temperature, pressure and much more! Getting this data, farmer can plan accordingly like-, irrigation time, determine heat events change the harvest time and improve plant growth.

### 4) Check the level of nutrient in the crops

Presently we all get good quality of foods, but having the right level of nutrition is vitally important. In smart farming farmers can manage the level of nutrients in the produce. To check, control or manage the level of nutrient in the food by in IoT technology made it possible. The nutrient analyzer sensor will monitor the level of nutrient in the crop. Every sensor relates to a specific ion that would sit on the side of membrane and these sensor checks when water passes through and detect the ion presence and its quality. like this it going to check the measurement of six ion simultaneously and the result will be shown in mobile phone. During plant's growth, farmers knowing the ion level, they can change the mix of nutrients and improve the plant's yield. Moreover, changing the proportion of nutrients, color and maturity rate of produce can also be altered. The time of growth, farmers knowing the ion level, if any changes found they can change the mix of nutrient and improve the plant's yield. The proportion of nutrients, color and maturity rate of produce can also be altered.

## 6. CONCLUSION

In this paper we discussed about the usage of IoT in agriculture field, IoT implementation details are understood through literature survey. Here we discussed about various sensors used in agriculture for getting better results about weather information, checking water level of soil, crop growth monitoring etc. All sensors are giving accurate information. In India IoT technologies are not much implemented in agriculture field where foreign countries are going forward with these technologies and getting good results. here farmers are facing many problems like no proper growth of plants, no automated systems used by farmers which results losses in production. If these technologies used by farmers wisely will give good results in agricultural industry this can be the future of our agricultural industry!

## 7. REFERENCES

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