A Survey On Internet Of Things And Cloud Computing For Agriculture

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***Abstract*— In today's world agriculture is very important in farmer and people's life, because without food production people cannot able to live. Farmer's day-by-day make food production in the world. This food production process has many difficulties in farmer's normal life in current world. The farmer's facing the difficulties in manually are monitoring the water, monitoring the human works, monitoring the animals, monitoring the dangerous animals, cost, and etc. These difficulties will be overcome through Iota technologies. This technology used to monitor the water through sensor, monitoring the normal animals and dangerous animals through sensor because farmers avoid risk and disease, and finally save and improve the farmer's production time, production cost, and health. In this paper, based on the survey paper, to help the farmers for increase the crop production between high and low quality through various algorithms. This algorithm used to find the best quality, and used to implement the manage climate change, soil erosion, and availability of water efficiently in various sensors. Finally, discuss about the trends and platform of the agriculture with various applications and finding the research gap.**

Keyword:Crop, Cloud Computing,Internet of Things,Sensors,Soil etc

I Introduction

Farming is the backbone for the advancement of the nation. India is called as an Agricultural country for its remarkable agricultural lands and its other resources. In recent days, the temperature and soil moisture factors affect the growth of agriculture such as productivity,diseases, and yield production. Agriculture based issues has been the barrier for the development for the nation.Internet of things, IOT, is a novel application domain that integrates different technologies (software) and devices (hardware) such as wireless telecommunications technology, sensors, Radio-Frequency Identification (RFID) tags, actuators,mobile phones, etc. Kevin Ashton invented the word 'Internet of Things' in 1999. The first interesting characteristic of IOT originated from the name that describes it. It is a set of physical interconnected objects or "Things". Physical entities can be an animal, humans, cars, environments, appliance etc. Furthermore, the "Internet" refers to the fact that "Things" are connected to the internet. Additionally, each "Thing" has anidentifier in order to be identifiable.. IOT make possible to use this technology in many application domains while because of existing limitations and challenges[1] only small numbers are now applicable to our community. Agriculture is one of the domains that have been affected by IOT and lead to a coined new area that named Precision Agriculture. According to [2], precision agriculture is an approach to use information technology (IT) to improve the quality of crops and increase yields. Overall, the goal of precision agriculture is to improve farmers' profits and harvest yields while declining the negative effects of farming on the environment that result from overuse of fertilizers. By 2050 II Literature Survey.Modern agriculture especially precision agriculture (PA)has a key role in helping to enhance crop yields[4].PApromises to make agriculture extremely effectiveness to mak sure high productivity levels and reduce the environmental impact of farming. Additionally, PA positive approaches have a marked effect on greenhouse gas emissions. Precision agriculture thanks to advanced technologies such as WSN, sensors, RFID, actuators, etc. is able to cut the amount of fertilizers and pesticides, as it optimizes the needs of the fields and indoor agriculture. In recent years, there have been advances in low-cost and low-power sensors. These sensors measure soil moisture, temperature, humidity and other parameters such as water content, outdoor temperature, wind speed etc. Data collected from the sensors analyze by data analysis methods which helping to extract more information from the data, decision making support systems and create more accurate prediction models. Moreover, PA also considered as an approach based on data[5]. Researchers use data mining methods (classification, clustering, regression,etc.) in order to deal with a complex issue, yield prediction.

The technologies used in smart agriculture enables the farmers to gain access to the GPS, soil scanning, and can better monitor the cultivating crops.

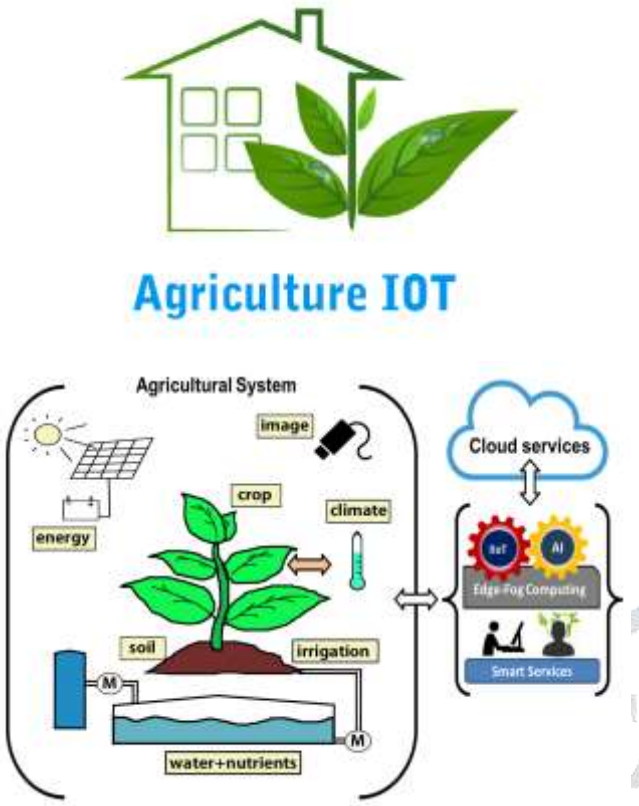

Fig 1 Modern Agriculture Iota Based System

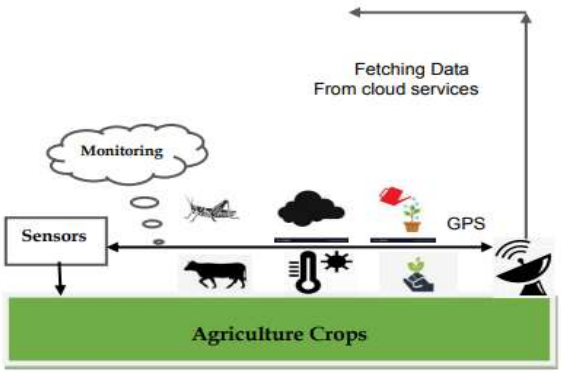

Fig 2 Process Flow of agriculture crop processing

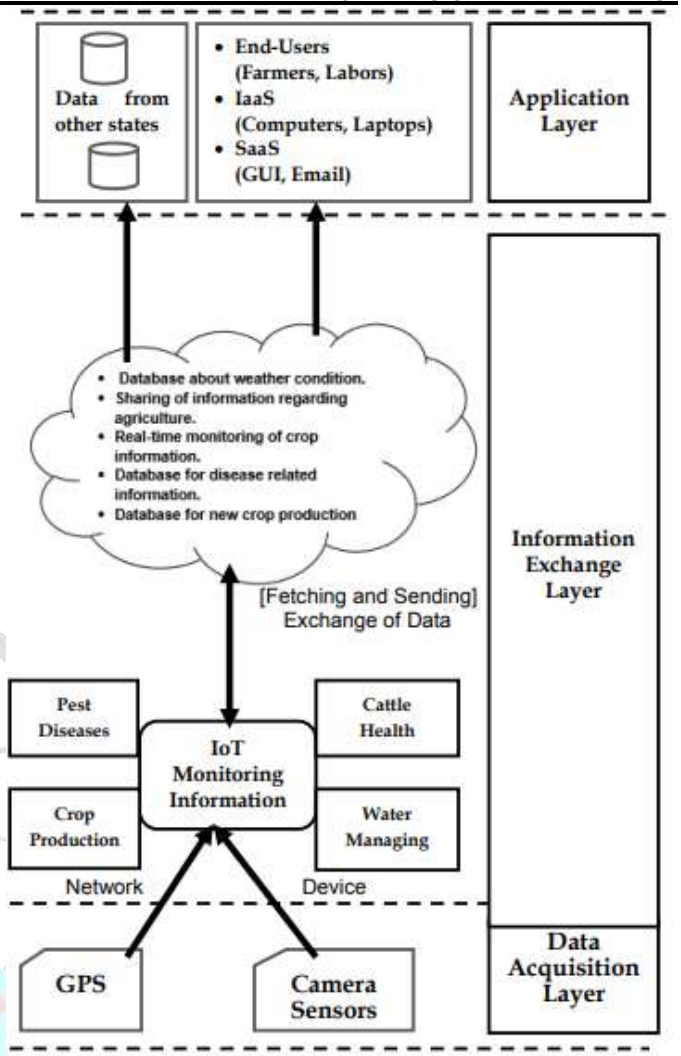

Fig 3 Cloud Based Iota Architecture

Cloud Based Iota Architecture

Cloud computing with Iota is very beneficial and ease of communication and information in agricultural sector. Both of these technologies are important now-a-days to improve the quality of the products produced by the agriculture. Here IoT is used to collect the data by using different sensors and cloud computing deals with managing the data gathered by IoT sensors. Internet of Things will connect the world's objects in both a sensory and intelligent manner through combining technological developments in item identification. In this section we provide a Cloud-IoT model of agriculture. The main purpose of this model is to elaborate that how data is collected and managed in Agriculture to highlight the importance of Cloud and IoT. The Cloud-IoT model is given as in Fig 3:

MAJOR CHALLENGES IN AGRICULTURE OF INDIA

Lack of Modern Agricultural Technology: One of the most challenge faced in Agriculture by Pakistan is the Lack of the Agricultural technology, because technology has great impact on the irrigation system

of agriculture, crop production, disease information about the crops.

Waterlogging and Salinity: This is also the major issue that India faces because waterlogging and salinity effects the plants and as a result there is a great reduction in crop production.

Old method of Production: This is also the main challenge towards Pakistan as the farmers in India uses old method and mechanism for production like sowing, harvesting and ploughing from the conventional tools.

Lack of knowledge towards farmers: Most of the farmers have lack of knowledge towards the crop like unknown condition about weather, prevent the crop from insects and pests the lack of these skills also effects the agricultural production.

Diseases of crops from pests: This is also one of the major issues in Pakistan because Pakistan suffer the problem by attacking of locusts on the crop that cause destruction.

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II Iota ENABLING TECHNOLOGIES

Machine Learning—the scientific field that gives machines the ability to learn without being strictly programmed. It has emerged together with big data technologies and high-performance computing to create new opportunities to unravel, quantify, and understand data intensive processes in agricultural operational environments. Machine learning is everywhere throughout the whole growing and harvesting cycle. It begins with a seed being planted in the soil—from the soil preparation, seeds breeding and water feed measurement—and it ends when robots pick up the harvest determining the ripeness with the help of computer vision.

Deep learning (DL) incorporates a modern technique for image processing and big data analysis with large potential. Deep learning is a recent tool in the agricultural domain, being already successfully applied to other domains. This article performs a survey of different deep learning techniques applied to various agricultural problems, such as disease detection/identification, fruit/plants classification and fruit counting among other domains. The paper analyses the specific employed models, the source of the data, the performance

Cloud Computing

Fig 4 Cloud Computing

Fig 4 shows Cloud computing refers to a cloud and that cloud refers to paradigm that consists of multiple things and technologies like data storages, interfaces, information technology, servers, applications and software[1]. Cloud computing is to manipulating, accessing, configuring and distribution of these technologies and connecting these technology infrastructure with the Internet. It is also called the paradigm of technologies because it gives a lot of the benefits to every sectors. The charm of cloud computing is that the services may be availed whenever and wherever needed as in [4]. Basically it is a pool of systems and are connected to public or private networks. Cloud computing technology is an emerging hot technology appeared in recent years; it is very similar with utility computing and grid computing, and is considered as combined product with the computer technology such as grid computing, utility computing, distributed computing, network storage, load balancing, and network technology [10]. The Cloud Computing is making our business applications mobile and collaborative, also gives user-friendly environment and make ease to use the technology infrastructure.

CLOUD COMPUTING MODELS USED IN AGRICULTURE

- **Software as a Service (SaaS) Model**: This model comprises of providing the software service to the end-users on demand. The service can be provided from cloud through the internet by the multiple end-users. Another feature of this model is that it can be used as per user basis such as software, Google applications, LinkedIn and other web applications.
- **Platform as a Service (PaaS) Model:** This model comprises of providing the computer platform to design and develop the particular software application. It also provides the tools for non-developers to build the web application, platform

basically included as operating system, database and web servers

. • **Infrastructure as a Service (IaaS) Model:** This model comprises of providing the component on which the cloud services can be availed and used. This model includes the components such as machines, virtual computer, database storage and servers.

SENSORS USED IN IOT FOR SMART AGRICULTURE:

- **Location sensors** use the GPS satellite signals to find latitude, longitude and altitude within the feet. It requires three location sensors to be fixed, since for triangulating the position.
- **Optical sensors** are used to measure the clay, organic matter and moisture content of the soil. These sensors are generally fixed to the drones.
- **Electrochemical sensors** provide the essential information about the pH and soil nutrient level.
- **Mechanical sensors** are used to find out the mechanical resistances of the soil.
- **Dielectric soil moisture sensor** measures the moisture level of the soil, by using the dielectric constant.
- **Parrot sensors** are used to monitor the plant's temperature, moisture, soil salinity. The information is sent to the farmers' mobile phone.
- **Spruce is a sensor** device, which is used for irrigation control. The data is saved in the cloud server and the user can access it at anytime and anywhere.
- **Koubachi** is used for sprinkling water to the plants in the garden. It acts a node that collects data from multiple sensors like air temperature, soil moisture, sun light etc.

III APPLICATIONS OF IoT IN SMART AGRICULTURE

Smart agriculture is not popular in India, still it shows dynamic capabilities for supporting agriculture. It supports the plant growth and development in many ways. Some of such applications are listed below to enhance plant growth:

- **Monitoring of Climate Conditions**

Climate and weather conditions are the primary factors to be noted during agriculture. Smart agriculture using IoT makes use of several sensors for monitoring the climate conditions of the surroundings. the task of the sensor is to collect the data across the field send it to the cloud. the cloud is loaded with some basic measurements which will then be compared with the sensed data.

- **Agriculture Drones**

One of the best applications of IoT in agriculture are Drones. Drones provide pictorial and aerial maps about the plants, thus making the farmer understand that which crop is in need of immediate attention. Drones also evaluate the health state, irrigation, monitoring of progress, spraying, and planting of each crop. Drones are helpful in saving time and effort.

- **Livestock Monitoring**

Livestock Monitoring is the way of tracking the state of the herds. the health of the animals is tracked using the IoT device and monitored for the signs of disease. The sensors connected to the animals will collect data about the location and well-being of the animals. The sensors can even track the state of pregnancies of cattle and intimate the state of the cattle which is about to deliver.

- **Smart Greenhouses**

Greenhouse farming is a technique that boosts the yield of crops, vegetables, fruits etc., Environmental parameters are controlled by Greenhouses in two ways; either through manual intervention or a proportional control mechanism. However, since manual intervention has disadvantages such as production loss, energy loss, and labor cost, these methods are less effective. A smart greenhouse through IoT embedded systems not only monitors intelligently but also controls the climate.

- **Crop Water Management**

Water is the essential resource for performing agriculture. All the agricultural activities are based on the adequate supply of water.

BENEFITS OF IOT IN SMART AGRICULTURE

IoT enables the large amount of data to be collected

- Over the sensors and thus providing better control over the internal processes and, as a result, lower production risks.
- With IoT efficient monitoring of the farming environment is ensured.
- IoT helps the farmers to monitor the fields a multiple locations by enabling remote monitoring. Decisions can be made in real-time and from anywhere.
- IoT guarantees increased crop production by keen tracking of planting, watering, pesticide application and harvesting.

IV CONCLUSION

The Survey paper has discussed about role of IoT in the field of agriculture. Various technologies supported by IoT, applications of IoT in smart agriculture are survey in this paper. This survey paper study the benefits of IoT in agriculture. Iota

and cloud computing is the emerging concept in the Globe, and a clear understanding of its concepts is more essential. This paper gives a brief assistance for the farmers in increasing agriculture yield and take efficient care in agriculture.

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