

The Smart Farming Techniques- The Use of Big Data, IoT, Artificial Intelligence, Robotics and Wireless Sensor Networks

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Abstract--- This paper contains the useful aspects of smart farming. How the smart farming can be implemented in Indian farms? Smart farming is the combination of big data analysis, robotics, The Internet of Things, Wireless sensor networks, data analysis. Smart farming in Indian farms can make the Indian farmers more efficient, they could know the exact soil moisture, humidity level, climatic conditions, fertility of the soil, and the exact use the fertilizers and urea to the soil, this can help the farmer to use the fertilizers in the right amount and hence it can prevent from wastage of money too. Big data analysis will be one of the important aspects of the paper on smart farming. The review of this paper is to check the socio-economic aspects and challenges to be addressed. The primary big data analytics can go beyond primary productions; it is influencing the entire food chain. This paper has a structured approach that can be used for future studies on this topic. In India, how the smart farming technique can be implemented is also covered in this paper.

Keywords--- Smart farming, Big data, IoT, Artificial Intelligence, Robotics, Wireless Sensor Networks, Data Analysis

I. INTRODUCTION

India is an agricultural country. Farming contributes 17-18% of the total GDP of India. India ranks 2nd worldwide in farm outputs. Agriculture employed are more than 50 % of the Indian workforce. Indian agricultural land is one of the greatest in the world. India ranks 1st in the net cropped area followed by the USA, China. But the conditions of the farmers of India still not good. Last year, 7.4% of the total suicides were done by the farmers face in India. One of the main challenges that farmers face in India is the bad yield and not get the right prices in Indian markets. One of the main reasons is the wastage of various types of useful fertilizers and urea. The farmers should make such smart that they should know how the soil is behaving, the right number of manures, fertilizers, and the area required for the soil.

The Smart farming technique can be one of the useful methods to overcome all these problems of the farmers. Though the smart farming technique is not a new concept. It has been implemented in various countries like Brazil, the USA, Chile, etc. to make more yield and more profits for farmers. Smart farming has very much scope as the field of big data, IoT has emerged drastically in the past decades. The use of IoT, big data analytics, robotics in the field of farming can be referred to as Smart Farming. The farm data grow in the big data which can be used in cloud

computing also and the use of sensors a field of Wireless sensor network in the farm to capture the soil features such as the fertility, urea content, moisture content, etc. and capture the climatic conditions such as humidity, temperature, etc. Real assistance will be required to give knowledge about the temperature and climatic changes that occur. This feature typically has the use of artificial intelligence techniques and robotics. It also includes the maintenance and use of the technology. Smart farming has the which means the smart devices are connected in the farms through the internet. The devices could extend the conventional tools like a rain gauge, tractor, etc. by adding autonomous features in all contexts like built-in-intelligence, capable to execute the autonomous actions on their own, or doing this remotely can help the farmers a lot.

A. Big Data

Big data and smart farming both are new concepts. Some experts said that big data may not have advert effects on the technology and it may fail to materialize, while others consider the big data applications may pass the peaks of inflated expectation.

Big data is nothing but the collection of a large amount of data that can be kept and can be fetched from the database of the big data. It can grow exponentially with time. There are three types of big data:-

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1. Structured
2. Unstructured
3. Semi- unstructured

The big data is one of most popular research topics for the research scholars. The following is the impact factor on the big data

Year	Journal Impact factor
2018-19	4.467
2017-18	4.981
2016-17	6.5

B. IoT

The IoT stands for the Internet of Things. The Internet of Things is nothing but it connects objects with the help of internet connectivity. The IoT-connected objects are now emerging technology in recent years. It requires a good internet infrastructure.

This technology can also be implemented in smart farming technology. The whole smart farming system is connected through the internet.

C. Artificial Intelligence

Artificial intelligence is the science which simulates human intelligence in machines and machines should be programmed to think like humans. The machines should be programmed to have the abilities of problem-solving like humans.

Artificial intelligence is one of the emerging technologies. Artificial intelligence has an impact on the workforce as in the next 20 years, 7 million jobs will be replaced by artificial intelligence but to improve the artificial intelligence more, 7.2 million engineers could require i.e., 7.2 million more jobs could be created. Artificial intelligence can have positive impacts on the workplace as it is emerging very quickly and by 2037 the impact of artificial intelligence will be doubled as of now.

D. Robotics

Robotics is the interdisciplinary science that was the computer science and engineering to make the robots- an automation machine which can have the intelligence just like a human being. It deals with the design, automation, programming, machine of the robots, etc.

Robotics is one of the major inventions that have been made in recent and is one of the important parts of the 5th generation of the computer. The various research is still going on the robotics.

E. Wireless Sensor Network

The wireless sensor network is the network of sensors that are connected without any wires involved. The wireless network is in very much demand in recent years. The wireless nodes are connected to a base station and with that base station, all nodes get information among themselves.

The wireless sensor networks are the dedicated sensors that are used to note the physical conditions and other environmental conditions and give the information according to their findings. The wireless sensor network can also be used to check the pollutants content, moisture content, humidity content, etc.

F. Data Analysis

Data analysis is the field of the analysis of the various types of data that are present in the world. The analysis process can be cleaning, transforming, and modelling data to discover useful information for business decision-making. Data analysis is the extraction of useful data from the bunch of data.

II. LITERATURE REVIEW

Many research scholars are researching smart farming techniques. Each research paper, review papers who are dealing with the smart farming techniques saying that smart farming is the need of the next generation farmers who needs better yields, better price with a low rate of loss.

There are many countries like the USA, Brazil, Chile, etc. have implemented smart farming techniques in their fields. In Brazil, smart farming has a successful journey for the last four to five decades. As Brazil is one of the main agriculture countries but its production was not that good in the months of 1960s but it brings innovative changes to their fields and Brazil has become one of the major exporters of the Agri-based products in the world. Since 1990, Brazilian agriculture is growing after introducing smart farming techniques in the country. According to a research paper published in Google scholar, smart farming techniques are one of the innovative processes to make the production more in the agricultural sectors.

In Chile, blueberry irrigation has reduced the volume of water used in farming by 70%. But, in India, the implementation of smart farming is very less, though in past decades the smart farming is becoming popular in Indian farms also. According to the researchers the IoT, robotics, mapping and geomatics technology, decision making, and various statistical processes are required for smart farming techniques.

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The implementation of smart farming will quite difficult in Indian farms because the farmers are India is very poor, lack facilities. Maintaining various types of data in big data will be very difficult for farmers. The maintenance cost of the smart farming system will also be quite more which can be another challenge for the farmers of India.

III. METHODOLOGY

A. *Big data analytics and IoT*

Big data analytics and IoT can play a vital role in smart farming as the big data concept will do the analysis of the data and save it in the cloud memory. The data are also equipped with deep learning mechanisms. The machines that are used in smart farming be equipped with sensors so that the sensor could have the data and can store it in the big data. The IoT can be used to connect the sensors remotely with the internet and can have the ability to execute autonomous actions on their own.

B. *Artificial intelligence and robotics*

The concept of artificial intelligence can be used in this smart farming as it could take smart actions whenever needed without interference from humans(farmers). The robotics concepts can also be used in the smart farming technique as one moving robot will be there who will move all around the field and check the fertility of the soil and the moisture content of the soil and could work accordingly to the data that is being found by the moving robot.

The information that is gathered by the robot will depend on the concept of artificial intelligence. The data captured by the robot should be stored in the big data memory. The robot should be made of various water detecting sensors so that it can detect the water content of the soil. The robot should be smart enough to tell whether the soil is good for farming or not and if not, how it can be improved.

C. *Wireless Sensor Networks*

The wireless sensor network can be implemented in smart farming as the ZigBee communication of wireless networks can be very effective in smart farming or smart agriculture techniques. The use of the ZigBee communication protocols with wireless Xbee modules, and conducting the tests like soil moisture present, soil fertility level, and other tests like collective data of the nature of the soil.

IV. CONCLUSION

This can be concluded that if the above reviews kept in mind the smart farming system can be made and implemented in the farms of India quite easily. But we should keep the price of the smart farming system low so

that more and more farmers can afford the smart farming system.

V. FUTURE SCOPE

There is a good scope of smart farming in Indian farms in the coming days. But we also keep in mind the condition of the Indian farmers that they are not so rich to afford the smart techniques of farming. The smart farming kit should be cheaper so that the farmer could buy and should have low maintenance cost then only it can succeed in the Indian farms.

Indian Government should give subsidies on buying the smart farming kit for the farmers. The smart farming kit can bring a revolutionary change in the agriculture field of India.

VI. ABBREVIATIONS

- A. *IoT- Internet of things*
- B. *AI- Artificial Intelligence*
- C. *WSN- Wireless Sensor Network*
- D. *USA- United States of America*

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Declaration: The above-mentioned information has been researched by me. The above-mentioned information is true and authenticates to my knowledge and belief

