International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 01 | Jan 2021 www.irjet.net p-ISSN: 2395-0072

A REVOLUTION IN AGRICULTURE USING INTERNET OF THINGS: SMART AGRICULTURE

Sowmya C L[1], Rashmi N[2], Vinod Kumar K P[3]

Dr. Ambedkar Institute of Technology, Bangalore, Karnataka, India

---

Abstract: *Nowadays, traditional agriculture is losing its importance. Meanwhile, with the increase in population and industrial revolution more and more new technologies are used in the agriculture that is smart agriculture. The rapidly growing Internet of Things (IoT) is gaining attention from every field. IoT is alteringeveryone's life styles and every industry aspect including agriculture. Smart agriculture brings revolutionary change in the traditional agriculture methods and creates new opportunities. This paper highlights the different IoT technologies, IoT devices and sensors used in smart agriculture. And also brief about advantages, challenges of smart agriculture.*

Keywords: Internet of Things, Smart Agriculture or Smart Farming, Sensors, Livestock monitoring, Precision farming.

1. INTRODUCTION

Internet of Things, IoT is so popular that it is covering every field. IoT is network of devices connected to internet which share the information. The devices can be any computing device, Smartphone, handheld device or anything that send and receive information over internet. IoT devices are embedded with sensors, actuators, processors, and transceivers [6].IoT is touching various applications in every field like health sector, education, transportation, parking system, agriculture, manufacturing, smart home and others. This paperis focused on IoT in agriculture field.

Traditional agriculture is type of framing which involves natural resources, organic fertilizers, traditional tools and some cultivation knowledge. Modern agriculture or smart agriculture which consists of advanced technologies involved in the practice of agriculture. With this new innovation in technologies and agriculture practice increases the quality and efficiency of production. Smart Agriculture or Smart Farming is a type of farming which uses innovative methods and modern technology. This type of farming will increase the quantity and quality of agricultural products [3].

The global population predicted by The Food and Agricultural Organization of the UN will reach 9.6 billion people by 2050. In order to balance food production must increase by 70% by 2050. So, IoT application is implemented in the field of agriculture to meet increasing global population. With the implementation of IoT in agriculture helps the farmer to effectively make use resources and land [1].

In traditional farming, farmer has to keep track of his yield manually, as and when he needs to look after the field for threats and he needs to be updated with weather changes. With the implementation of IoT in farming will provide automated system, which functions without any human intervention and notifies the farmer even if he is not on the field. The farmer then makes the choice to solve the problems. Another factor which is affecting the yield of farmer is changing weather condition, so the IoT smart agriculture application will notify the farmer to take fast actions to prevent from harming the yield[4].

Managing Livestock is one of the booming areas in smart agriculture. IoT is used to monitor the health and state of farm animals, which collects the data and analyze that data for different reasons [1].

2. BENEFITS OF IoT IN AGRICULUTURE

Using IoT application in farming collects huge data from sensors and this data is managed using cloud services. This data can be related to field maps, crop condition, weather condition, soil condition, etc. which can be accessed live from anywhere. This helps in live monitoring or remote monitoring of the farm as well as staff[8][4].

With the use of IoT application in farming will reduce the production cost. IoT also helps in managing the livestock farming. If there are any anomalies in crop yield or health of livestock can be seen and farmers will be able to decrease the probability of losing yield[7]. IoT in agriculture helps in efficient use and conservation of natural resources like water, soil, etc.

With the use of IoT application in agriculture gives the capability to predict about production yield from this it helps farmer to plan about distribution of product. This

IoT in farming gives better supervision over process of production and also yields good quality and quantity of crops[7]. Eventually with all these farmers earn higher revenue.

3. APPLICATION AREAS IN AGRICULTURE

Traditional method of farming can be changed by implementing sensing and IoT technologies in agriculture process [2]. There are few key application areas in which IoT can structure the future of farming.

1. Fleet management: This is tracking of farm vehicles[1]. Nowadays vehicles or equipments are equipped with GPS tracking devices. This GPS device tracks the vehicles and equipments all time thus protecting it from theft. This device can also be helpful in organizing the farm land and crops.

2. Monitoring Climatic Conditions: Climate plays an important role in agriculture. IoT applications are located across the field and they collect various data related to environment which helps in choice of crop. IoT solution helps to known real time weather condition.

3.Water Monitoring: Adequate water is essential for farming. IoT application integrated with sensors ensures proper water management and reduces unnecessary wastage of water [8].

4. Precision Agriculture or Precision Farming: This of farming practice makes more precise and controlled. The data generated from sensors are analyzed and to react according to that data by taking intelligent decisions. There are different precision farming techniques like irrigation management, livestock monitoring, vehicle tracking and more.

5. Greenhouse Farming: This provides good growing conditions, protects from changing weather and various pests. A smart greenhouse consists of IoT, which monitors and controls the climate thus eliminating human intervention. Makes use of different sensors that measure parameters of environment based on plant. This gives low cost and best solution for farmers. Not only it senses the climatic changes but it also senses light levels, pressure and temperature. Based on sensor data it performs the required action [10].

6. Agricultural Drone: Drones are trending equipment in the field of agriculture. There are ground-based and aerial-based drones. These can be used to assess the crop health, crop monitoring, spraying, field and soil analysis [9].

7. Livestock Monitoring: IoT sensors can be attached to farm animals to monitor their health and to locate the animals. This helps the farmer to identify sick animals and separate it from other before the disease spreads [10].

8. Crop Disease and Pest Management: Due to pest and crop disease their huge loss to farmer in the yield of crop. IoT devices help farmer to spot the disease or pest in the crop and uses pesticides significantly. This diagnosis of disease or pest is done through image processing. The IoT device with camera captures the raw image of crop from the farm field [2].

4. CHALLENGES

Sensors, equipment's which are used in IoT may be costlier for farmer to buy. The integration of these sensors and integrating the sensor data to analyze it. To deploy sensors or IoT device in farm area requires communication technologies. To deploy for large farm area requires choosing the communication network, which must be reliable. Choosing sensors from different sensor brands are easier but to setup and maintain monitoring and automation system requires software expertise. Integrating software with sensor and equipment is time consuming [10].

5. CONCULSION

In this paper, we briefed about traditional farming and Internet of Things. If IoT is implemented in agriculture becomes Smart Agriculture, which aims to deliver efficient crop production. Smart Agriculture yields better quality and quantity of crops. In Smart farming equipment are equipped with sensors. These sensors collect data about crop and field and stored in cloud. This data is analyzed and accordingly appropriate action is taken. In this, we also discussed about the application areas of smart farming. To efficiently use the agriculture for better production in nowadays it is necessary to implement IoT sensing and communication technologies in agriculture.

REFERENCES

[1] Saverio Romeo, "Overview on Smart Farming", A White Paper from Beecham Research.

[2] Muhammad Ayaz1, Mohammad Ammad-uddin, Zubair Sharif, Ali Mansour, el-Hadi M. Aggoune, "Internet-of-Things (IoT) based Smart Agriculture: Towards Making the Fields Talk", DOI 10.1109/ACCESS.2019.2932609, IEEE Access.

[3] Ritika Srivastava, Vandana Sharma, Vishal Jaiswal, Sumit Raj, "A Research Paper on Smart Agriculture Using

Iot", International Research Journal of Engineering and Technology (IRJET), Volume: 07 Issue: 07 | July 2020.

[4] Jash Doshi, Tirthkumar Patel, Santosh kumar Bharti, "Smart Farming using IoT, a solution for optimally monitoring farming conditions", The 3rd International workshop on Recent advances on Internet of Things: Technology and Application Approaches, November 4-7, 2019, Coimbra, Portugal.

[5] Dr. Aditya Tiwary, Er. Vikram Puri, "Internet of Things (IoT): Research, Architectures and Applications", International Journal on Future Revolution in Computer Science & Communication Engineering, ISSN: 2454-4248 Volume: 4 Issue: 3.

[6] Pallavi Sethi and Smruti R. Sarangi, "Internet of Things: Architectures, Protocols, and Applications", Hindawi Journal of Electrical and Computer Engineering, Volume 2017.

[7] Accesed: https://dzone.com/articles/iot-in-agriculture-five-technology-uses-for-smart

[8] Anand Nayyar, "Smart farming: IoT based smart sensors agriculture stick for live temperature and moisture monitoring using Arduino, cloud computing & solar technology", Conference Paper, November 2016 DOI: 10.1201/9781315364094-121, Research Gate Publication.

[9]Accessed:https://www.biz4intellia.com/blog/5-applications-of-iot-in-agriculture/

[10]Accessed: https://www.iotforall.com/iot-applications-in-agriculture

[11] Supriya Ghavate, Joshi H. U, "Smart Farming using IoT and Machine Learning with Image Processing".

[12] S Vasanti Venkateshwar, Mohammad Mohiddin, "A Survey on Smart Agricultural System using IoT", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181.

[13] A NESS SES white paper on "Capitalizing on the Business Value of the Internet of Things: The Time to Act Is Now".

[14] Dr Albrecht Becker, Grégoire Sénéclauze, Purshottam Purswani, Sudharma Karekar, "Internet of Things" ATOS white paper.

[15] Kaivan Karimi, Gary Atkinson, "What the Internet of Things (IoT) Needs to Become a Reality", ARM white paper, freescale.com / arm.com