



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SP1: 422-425

Veerpal Kaur
Assistant Professors,
Department of Computer
Science, Baba Farid College,
Bathinda, Punjab, India

Ramandeep Kaur
Assistant Professors,
Department of Computer
Science, Baba Farid College,
Bathinda, Punjab, India

Correspondence
Veerpal Kaur
Assistant Professors,
Department of Computer
Science, Baba Farid College,
Bathinda, Punjab, India

(Special Issue- 1)
2nd International Conference
**“Food Security, Nutrition and Sustainable Agriculture -
Emerging Technologies”**
(February 14-16, 2019)

Role of IoT in agriculture

Veerpal Kaur and Ramandeep Kaur

Abstract

Today's different type of technologies, techniques and tools are used in agriculture sector. To improve the productivity, efficiency and reduce the time, cost and human intervention, there is a need of new technology called as Internet of Things. To automate the agricultural activities like water management, soil monitoring, crop management, livestock monitoring etc. different types of sensor are used. Smart Greenhouse protect the plants from extreme weather. To control all these operations remote smart device, computer connected with internet, sensor, camera, micro-controller etc. are used. Growth in agriculture sector effects economic condition of the country. This paper focus on Role of IoT in Agriculture that defines Smart Farming.

Keywords: IoT, Sensor, productivity, smart farming

1. Introduction

Agriculture is an important part of India Economy and is the backbone of country. Like India and other countries, majority of country population depends on Farming and nations incomes has comes from farming. Farmers grows many things such as fruits, vegetables, cotton for clothes, corns and many other things for us. Now a day, many tools and techniques are available for farming. According to the UN Food and Agriculture Organization, in order to feed the growing population of the Earth, the world will need to produce 70% more food in 2050 than it did in 2006^[1]. To fulfil this demands, the agriculture companies and farmers are shifted from traditional farming to smart farming.

Today's many agriculture industries depend on IoT Technology for smart farming to increase the efficiency, for global marketing, to increase the profit in less time and cost and others features like minimize the human intervention in farming. IoT (Internet of Things) is the efficient and popular technology. IoT included different types of sensor, electronic devices, networks components and software's. IoT allows the users to share their data in networks without human involvements. To increase the productivity, efficiency and to minimize the problems in agriculture that is faced by the farmers, there is a requirement to use latest technology and techniques is known as Internet of Thing. Now a day, Farmers can get a lot of knowledge and information about latest technology and farming techniques through IoT. In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system^[2]. Farmers can monitor their fields from anywhere, anytime.

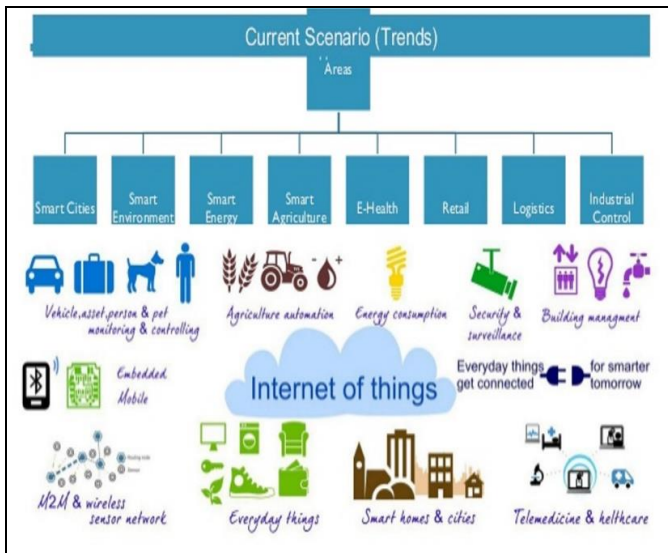


Fig 1: IoT Different fields [10].

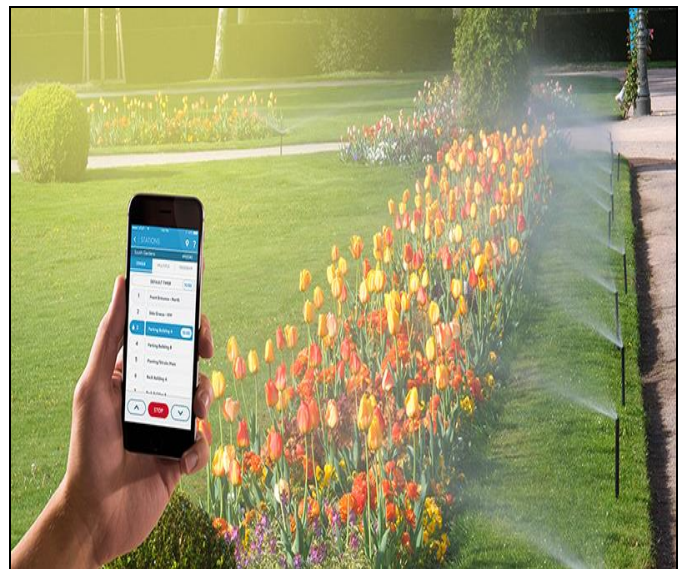


Fig 3: Smart Irrigation System [11].

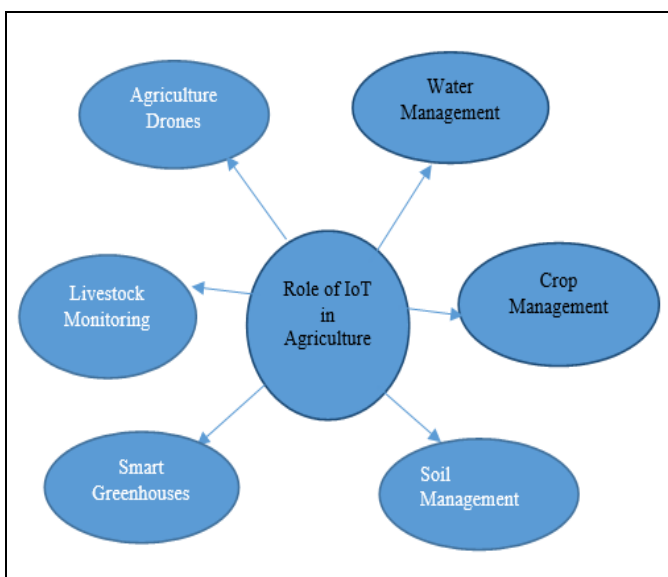


Fig 2: Role of IoT in Agriculture

Crop Management

IOT technology helps in collecting information about conditions like weather, moisture, temperature and fertility of soil, crop online monitoring enables detection of weed, level of water, pest detection, animal intrusion in to the field, crop growth, agriculture [4].

Wireless Sensor Network and Micro Controllers are used to monitor and control the farm processes. By using this technology, the farmer can guess the fertility of soil and decide which type of crop grow.



Fig 4: Crop Management [12].

2. IoT Application in Agriculture

2.1 Water Management

Water management can be efficiently managed by IoT Technology to avoid the wastage of water using different types of sensors. The sensors are used to check the level of water, by placing the sensor into water tank and data is stored on the cloud by using mobile application. Farmers can check level of water through their mobile phones. According to this technology the motor will work automatically. If the level of water is low, then motor will automatically have switched on, and if level of water is up then it will shut down motor.

In traditional irrigation system, as much as 50% of this water is wasted due to overwatering caused by inefficiencies in traditional irrigation methods and systems [3]. To solve this problem, smart irrigation system using IoT helps farmers to avoid wastages of water, improve quality of crops by irrigating at correct time. In smart irrigation system, Temperature sensor and Soil sensor are placed on the fields, these sensors send fields information to farmers through information gateway. Weather based smart irrigation controllers use local weather information to maintain and adjust irrigation schedules.

2.3 Soil Management

Soil Management using IoT helps farmers to monitor the soil and decide the crop to be planted in the soil. Farmers can check the soil temperature, pH rate and humidity on regularly basis. The farmers can check soil monitoring report from their mobile phone via wireless network at any time. If they notice abnormalities, they can immediately notice their land and use pesticides to overcome the abnormalities [5].

To test the soil different type of sensors are used such as temperature sensor, pH sensor, humidity sensor. Different

crops require different irrigation strategies and using real time data of soil moisture a farmer can increase yield by maintaining an optimal soil moisture for a specific crop ^[6].



Fig 5: Soil Management ^[13].

Smart Greenhouses

Smart greenhouses help the farmers to do work in their farms automatically without the use of manual power. Greenhouse is being used to protect the plants from extreme weather like pest attacks, insect, ultraviolet radiations, wind and hailstorm. The irrigation of agriculture field is carried out using automatic drip irrigation, which operates according to the soil moisture threshold set accordingly so as optimal amount of water is applied to the plants ^[7]. Based on data collected about the soil, an amount of potassium, nitrogen and other minerals are applied to fields using different techniques.

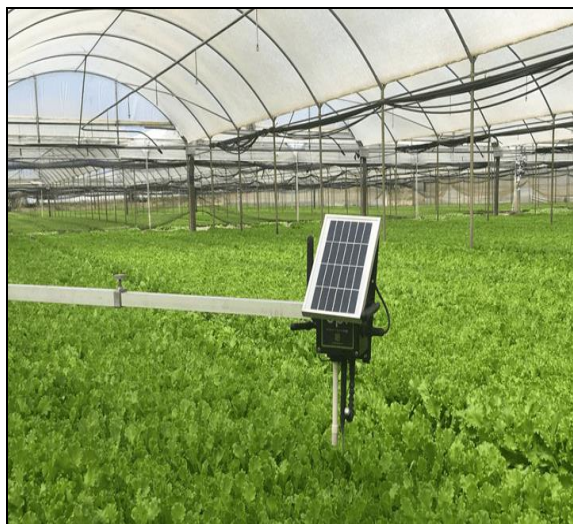


Fig 6: Smart Greenhouse ^[14].

Livestock Monitoring

IoT Technology helps farmers to monitor the health of their livestock, eating habits, location and reproductive cycle etc. Connected sensors in the wearable can monitor blood pressure, heart rate, respiratory rate, digestion, temperature and other vitals that allow a farmer to be alerted at the first sign of illness ^[8].

IoT can also help farmers during a cow's reproductive cycle to monitor when they are ready to give birth. IoT devices notify the farmer about the condition of cow's. IoT wearable sensor devices are also track the location of an animal which helps farmers to immediately locate a sick animal and give them proper treatment.

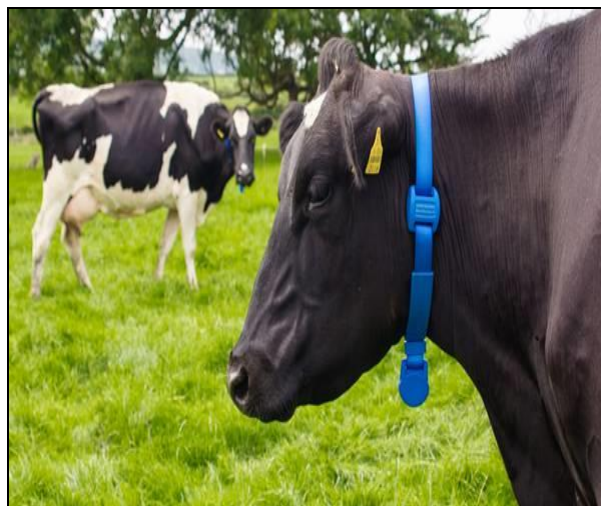


Fig 7: Wearable sensor ^[15].

IoT devices are very helpful for dairy farmers who have multiple cows that need to be milked several times a day. Robots are used for milking sessions. Sensor is attached around a cow's neck which give signal to the robot that cow about to be milked. It also checks animal's milking speed, quality and quantity of milk produced, diet of each animal. It helps farmer to determine which cows are able to produce maximum milk.

2.6 Agriculture Drones

Agricultural drone has play important role in agriculture. The Drones provide in-flight observation and monitoring. It helps the farmer in various ways such as soil fertilising, spraying pesticides and seeding. Different types of Drones are used in Agriculture like Crop Spraying Drones, Surveillance Drones, Seeding Drones to improve productivity.

From the drone data, we can draw insights regarding plant health indices, plant counting and yield prediction, plant height measurement, canopy cover mapping, field water ponding mapping, scouting reports, stockpile measuring, chlorophyll measurement, nitrogen content in wheat, drainage mapping, weed pressure mapping, and so on. ^[9] To use Drones are economical and cheap way to manage farming.



Fig 8: Agriculture Drone ^[16].

Table 1: Table of techniques

S. No	Techniques used	Advantages	Disadvantages
1.	Water Management	Use water only when and where needed.	To set up sensor system is expensive.
2.	Crop Management	Avoid crop losses through diseases or Adverse weather. High quality crop production	Time consuming. Require intensive labour to collect data regularly.
3.	Soil Management	Farmers can check the soil temperature, pH rate and humidity on regularly basis	Lack of accuracy in sandy soils due to their large particles. Requiring periodic service. Need for each soil type is calibrated.
4.	Smart Greenhouses	Measure and control the environmental parameters according to plant requirement.	Smart Greenhouse farming can get expensive. Require constant care with maintaining temperature.
5.	Livestock Monitoring	Used to detect reproduction and heath of animals earlier.	It involves lots of money and time.
6.	Agriculture Drones	It provide in-flight observation and monitoring. It helps the farmer in various ways such as soil fertilising, spraying pesticides and seeding	Flight area and time. farmers needs to take Federal Aviation Administration (FAA) operator Traning. Drones are dependent to climatic conditions..

Conclusion

Farming play important role in the growth of nations. Thus there is need of smart farming using Internet of Things. It helps farmers to grow different types of crops in their fields with minimum efforts. it increase efficiency, global market, productivity and other features. Farmers can get required information or data about their filed through their smart phones and IoT devices. IoT works in different domains like Water Management, Crop Management, Smart Greenhouses, Soil Management, Livestock Monitoring etc.

References

1. <http://www.iosrjournals.org/iosr-jce/papers/Conf.16051/Volume-1/13.%2056-57.pdf>.
2. file:///F:/session%202019/search%20paper%20material/iot%20in%20agriculture/IoT%20Applications%20in%20Agriculture%20_%20IoT%20For%20All.html
3. <https://www.hydropoint.com/what-is-smart-irrigation/>
4. http://www.takeoffprojects.com/Download%20links/Java/Java_2017_2018_Abstracts/INTERNET%20OF%20THINGS/Agricultural%20Crop%20Monitoring.pdf
5. http://www.ijera.com/papers/Vol7_issue11/Part-6/I0711065559.pdf
6. https://www.researchgate.net/publication/313807853_An_IoT_based_system_for_remote_monitoring_of_soil_characteristics
7. <https://www.semanticscholar.org/paper/IoT-based-smart-greenhouse-Kodali-Jain/c4b2861f8bf2621e2d3b72dfec4a535d3845aea3>
8. <https://www.precisionag.com/systems-management/using-iot-to-increase-efficiency-productivity-for-livestock/>
9. <https://www.iotforall.com/iot-applications-in-agriculture/>
10. https://www.researchgate.net/post/Is_Internet_of_Things_IoT_the_future_of_agriculture/1
11. <https://www.hydropoint.com/what-is-smart-irrigation/>
12. <http://www.en.netralnews.com/news/business/read/24343/smart.farming.40..the.future.of.indonesia.s.agriculture>
13. <https://www.valarm.net/wp-content/uploads/2016/07/Valarm-Blue-Apron-Remote-Monitoring-Industrial-IoT-Sensor-Telemetry-Agriculture-Ag-Soil-Moisture-Water-Air-Quality-Temperature-Humidity-Light-2-meteo-circle.jpg>
14. <https://rstylelab.com/company/blog/iot/iot-agriculture-how-to-build-smart-greenhouse>
15. <https://files.precisionag.com/precisagms/wpcontent/uploads/2017/04/moomonitor3.jpg>
16. <https://krishijagran.com/farm-mechanization/drones-in-indian-agriculture/>