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Popular Article

## Role of IoT in Transforming the Future of Agriculture

Rinku Grover<sup>1</sup>, Deepak Kumar<sup>2</sup> and Manik Nager<sup>3</sup>

<sup>1</sup>Department of Processing & Food Engineering; <sup>2</sup>Department of Nematology; <sup>3</sup>Department of Renewable & Bio-energy Engineering  
CCS Haryana Agricultural University, Hisar (Haryana)  
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Internet of things (IoT) Applications in the Agriculture will play the import role to reduce the labour cost and increase the agricultural investors, prosperity of farmers, productivity and sustainability. Monitoring on real time of Agricultural system play a key role for reducing the cost of operation as well as input cost and enhance the rural labour efficiency in the farming system such as fish, livestock, and cattle farming. IoT technology based monitoring of Agricultural operation on real time may be incorporated in the crops, crops cultivation practices, crop health assessment, identification of presence of insect in the crops, grain storage practices, quality and climate monitoring during the transportation of grain from farmer to mandi, monitoring of farm labour and management system, quality control during the value added product production inside the Agricultural industry. Climate parameter such as temperature and humidity, chemical and fertilizer application inside greenhouse maybe monitored and control by IoT enabled transceiver. Temperature and humidity inside the storage structure and pest, disease and self-life of harvested grain may be monitored. Monitoring of Goat, pig and poultry farming for feeding, heath assessment, hygienic maintenance of farm, climate parameter, light condition, growth of cattle can be monitored from IoT monitoring gadget. Natural

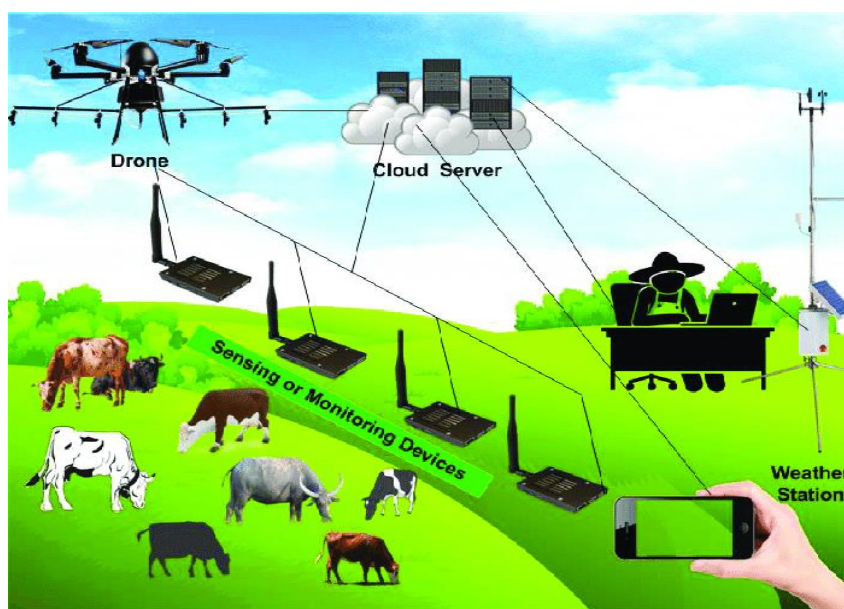
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input resource like water, seeds, fertilizer can be saved significantly by accurate application during crops cultivations. New agricultural applications e.g., smart farming, precision farming and automation may be managed through IoT enabled devices to increase operational efficiency, lower the costs of operation, reduce waste, and improve the quality and quantity of yield. IoT in agriculture technologies comprise specialized equipment, wireless connectivity, web and mobile software and IT services.

### Applications of IoT in smart farming

The use of technologies like the Internet of Things, sensors, navigational aids, robotics, and artificial intelligence on farm is referred to as "smart agriculture." The ultimate objective is to maximize the use of human labor while raising crop quality and yield. Smart farming is developed for monitoring the crop field with the help of sensors and automating the irrigation system. The farmers can monitor crops field and control the operation from anywhere with the help of IoT enable smart farming digital gadget for efficient farming as compared with conventional farming approach. In addition to targeting conventional, large farming operations, IoT-based Smart farming can also serve as a new lever for uplift of other rising or common trends in agriculture, such as organic farming, family farming and enhance the use of human labor and quality of crops and their yield (Fig. 1).



**Fig. 1. Applications of IoT in smart farming system**

### **Applications of IoT in precision agriculture**

An information and technology-based farm management system is used to identify, analyses and manage variability within fields by doing all practices of crop production in right dose, right input, and right place at right time in right way for optimum profitability, sustainability and protection of the land resource. Precision farming can be made the farming practice more controlled and accurate when it comes to raising livestock and growing crops. The use of information technology (IT) and other tools like sensors, control systems, robots, autonomous vehicles, automated hardware, variable rate technology, yield monitor etc are vital elements in this kind of farm management. Inbuilt IoT transceiver with GPS module in the robots, Autonomous Agricultural vehicles may be operated from any location. The IoT transceiver with GPS module and soil moisture probe technologies work together to offer complete local in-season agronomy support as well as suggestions for improving water use efficiency.

### **Applications of IoT in the agricultural drones**

Technology has changed over time and agricultural drones are very good example of this. Drones are being used in agriculture in order to enhance various agricultural practices. IoT transceiver with GPS module in the drones for gathering valuable data via a series of sensors that are used for image/video capturing, GIS mapping, multispectral and thermal reflection data, visual imagery during the flight and surveying of agricultural land etc. Chemical spraying by drone is one of very good option to be used in this crop. Data received from IoT incorporated drone may be stored in the cloud, it may be used to determine 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 from stored data at a center.

### **Applications of IoT in the livestock monitoring**

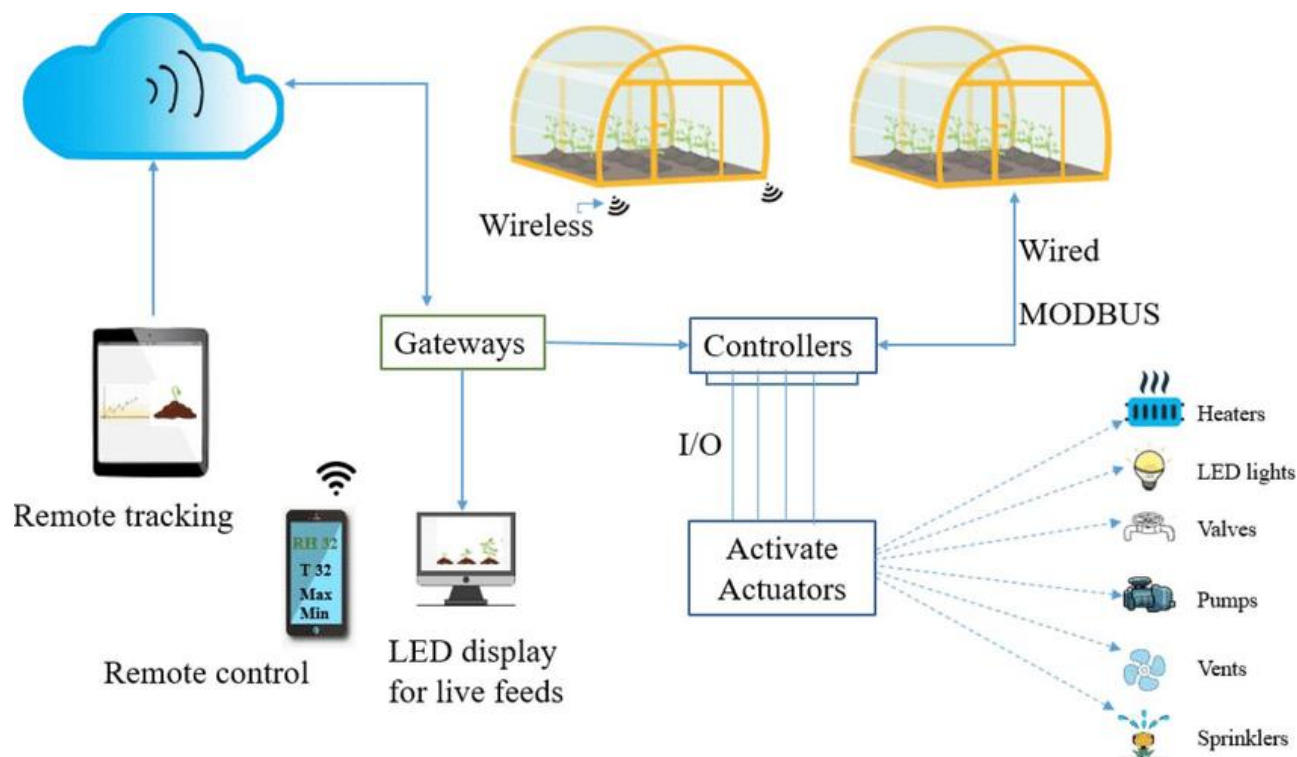
Large area farm holding owners may utilize IoT applications to record the data such as GPS location, presence of well-being, and health of their cattle. This recorded data helps them in identifying their animals that are sick so they can be isolated from the herd, thereby preventing the spread of disease. It also reduces the labor costs as ranchers can locate their cattle and also the cattle



owners can observe their cows that are pregnant and about to give birth with the help of IoT based sensors.

### Applications of IoT in the greenhouses

Greenhouse farming is a methodology that helps in enhancing the yield of vegetables, fruits, cash crops etc. Crops may be grown even in unseasonal period in the Greenhouse. Monitoring and controlling the climatic parameter via an embedded IoT technology in the greenhouse could eliminate the need for manual intervention etc. Different sensors that measure environmental factors accordingly to generate the ambient ambience and deliver the input as per plant demand are used to regulate the environment inside the IoT embedded greenhouse. A cloud server can be created outside of greenhouse for accessing the environment inside the greenhouse using IoT for eliminating the need of constant manual monitoring. The IoT sensors in the greenhouse provide information on the light levels, pressure, humidity, and temperature and water requirement. IoT technology integrated Actuators automatically open/close the window, turn on/off lights, heaters, mister fans, pump.



**Fig. 2 Applications of IoT in the greenhouses**



## Conclusion

The IoT applications in the agriculture are making it possible to collect useful data for farmers and ranchers. IoT enabled precision agriculture are being used to optimum input application to achieve high crop yields and reduce operational costs by knowing variability within the field and cattle. IoT enabled agricultural Drones are being used in agriculture in order to enhance various agricultural practices. Livestock tracking and geo-fencing Farm owners can utilize IoT applications. IoT integrated Greenhouses may be monitored and control the climate. IoT enabled Smart farming may reduce inputs and enhance productivity of fertilizer, water, utilization etc. and help in automating the irrigation system.

