Chapter 8
NB-IoT for Agriculture

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ABSTRACT

Use of NBIoT in agriculture can enhance the performance in many aspects. Resource management in agriculture is one of the key aspects. Resources which are used to increase the harvest are underutilized because of the non-availability of precise monitoring facilities. NB-IoT can help in the optimal utilization of resources. It can accurately sense the level of usage of resources and enhance the utilization efficiency. NBIoT associated with variety of sensors for sensing water, fertilizer concentration, humidity levels can help in monitoring applications and provide great degree of precision. With NBIoT, remote controlling of the resources is possible. Use of NBIoT for agriculture reduces the energy consumption levels and overall cost involved which is ideal for farmers. Even the harvest can be increased by efficiently distributing the nutrition to the plants with NBIoT-based precise techniques.

INTRODUCTION

Agriculture is considered to be the backbone of the economy for any country. Explosive growth is expected in the number of Internet of Things (IoT) based devices in our digital connected living environment. Studies have revealed that number of IoT devices will grow up to 26 billion by 2020. This increase is 30 times compared to the number of IoT devices estimated in 2009 (Fernández & Fraga, 2018). IoT devices are going to become integral part of 5G. IoT devices have the ability to interact with the real world and extract useful information and facilitate ease of communication. This involves connecting sensors, actuators, appliances, cars and so on with internet. This is going to change our daily lives by providing solution to agriculture, health related sectors, transportation etc. Both academicians and industry people are working on IoT because of the value that IoT promises and evolution market. IoT basically addresses flexible connection between people and things or devices irrespective of time, location using any network and any service. This is very demanding and pleasing because here, devices are understanding the needs of human beings and acting accordingly (Perera et al., 2014). IoT is a tech-

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nology which is a combination of the recent trends in the fields of sensing, cloud computing and mobile computing technologies (Ang & Seng, 2019).

However, IoT-based agricultural monitoring results have been acknowledged based on the sub-domains to which they fit in. The identified sub-domains are soil nursing, air specialist care, temperature monitoring, water monitoring, disease monitoring, location monitoring, environmental conditions monitoring, pest monitoring, and fertilization monitoring. Further, the IoT paradigm improves human communication in the physical world through low-cost electronic devices and communication protocols. IoT also monitors different ecological conditions to create dense and present maps of noise level, air, water contamination, temperature, and damaging radiations. Besides, data collected about different environmental parameters is transmitted to the user by trigger alerts or sending endorsements to authorities via posts.

In the past few eras, a great quantity of revisions has been offered in the IoT-based agriculture field. Therefore, it is significant to gather, summarize, examine, and classify the state-of-the-art research in this area. The purpose of this research is to present all-inclusive methodical literature assessment in the field of IoT agriculture. The charities of this paper related to the IoT agriculture domain are as follows.

Of late, the Internet-of-Things (IoT) is opening to influence a wide range of sectors and industries, ranging from industrial, health, communications, and energy to the agriculture industry, in order to decrease ineptitudes and improve the routine across all markets. If looking closely, one feels that the current submissions are only rubbing the surface and that the real influence of IoT and its customs are not yet observed. Still, considering this advancement, especially in the near past, we can predict that IoT technologies are going to play a key part in several requests of the agriculture segment. This is for the reason that of the competences offered by IoT, including the basic communication organization (used to connect the smart objects—from sensors, vehicles, to user mobile devices—using the Internet) and range of services, such as local or remote data attainment, cloud-based intelligent information investigation and decision making, user interfacing, and agriculture procedure automation. Such aptitudes can transform the agriculture industry which probably one of most unproductive sectors of our monetary value chain today.

By executing the modern identifying and IoT technologies in agriculture practices, every feature of out-of-date agricultural method can be essentially changed. Currently, unified incorporation of wireless sensors and the IoT in smart agriculture can raise agriculture to levels which were previously unbelievable. By following the performs of smart agriculture, IoT can help to progress the solutions of many out-of-date farming issues, like drought response, yield optimization, land suitability, irrigation, and pest control.

One of the forms of IoT is narrowband IoT (NBIoT). NBIoT is specially designed to suit the low data rate applications of upcoming massive IoT market. NB-IoT is capable of handling large connections consuming less power and gives wide area coverage. This is the reason it is famously known as Low Power Wide Area (LPWA) Technology. These features in fact give an edge to this technology especially in the large-scale implementations and long-term sustainability. NBIoT has been considered compatible with current digital disruptions mainly because of the accuracy features that it inherits. This is mainly because of the large number of sensors and actuators that it uses. Researchers are currently focusing on optimization of deployment strategies to overcome the overheads and looking forward to enhancing the coverage area. NBIoT has been proven to be cost effective compared to other forms of IoTs. NB-IoT uses licensed bands and overcomes congestion problems. NBIoT operates with GSM and LTE networks, hence avoiding deployment charges. NBIoT uses a smaller number of resources for its operation. There is high degree of performance improvement possible with certain low latency methods (Ratasuk et al., 2016).