A Survey on Wireless Sensor Network For Agriculture

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***Abstract*—** Wireless sensor Network is widely used in agriculture field. It provides a new direction of research in agricultural domain. WSN gives various benefits such as crop monitoring, crop management and water management. The aim of this paper to review the need of WSN in agriculture field such as real time data capturing from field, devices used etc. Farming is one of the major domain where WSN is used. It is very difficult to do the field management manually. With the help of WSN farmer can capture real time data from field and it will be beneficial for crop management.

Keywords-*Wireless Sensor Network, Precision Agriculture, Sustainable Agriculture*

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I. INTRODUCTION

India is an agriculture country and agriculture plays important role in country's economical growth. So, productive and sustainable growth is important in agricultural field. In our country, crop production management is usually done by some expert or farmer. But is difficult to manage crop production by open eye observation.

Traditional method for crop production requires an implementation of various series of tasks, such as planting, fertilizing, harvesting, with a predetermined schedule. However, agricultural and environmental data can be collected to use for more intelligent decisions such as weather, soil and air quality, monitoring of crop growth and even equipment and labor costs etc. This is known as precision agriculture [7] [8] [10] [11].

Need of WSN in Agriculture

Sensors are used for collecting live data from field and process it. Agriculture domain poses several requirements that are following:

I) Collection of real time data from field such as soil moisture, temperature, humidity and rainfall etc.
II) Processing on captured data.
III) Send alert message to user/ farmer.
IV) Monitoring of distributed land.
V) Management of water requirement to crop.

In India, there is water scarcity problem as there are variation in rainy season and rainy season is not constant throughout year in India. Due to this, water management in farming is very important. Wireless sensor network plays important role in water management. Wireless sensor networks as tool provides crop productivity, quality, resource utilization, crop management. The main purpose of WSN to increase crop productivity that will lead to improve farmers economical condition. WSN provides way to capture live data with numerous devices and provide solutions to agricultural issues.

II. LITERATURE SURVEY

Divya P [3] proposed a context aware wireless sensor system for water management in farm. This system is developed to solve water scarcity problem in agriculture field. The system will monitor various parameters such as envirmental parameters, soil parameters, hydrological parameters. These parameters used for automatic control of water management. The results of conducted experiment shows that system reduce waste of water.

B. Balaji Bhanu [4] proposed system to increase productivity and quality of farming using wireless sensor networks. The system monitors humidity, temperature and carbon dioxide levels in farm and farmer can get these parameter measurement from web. Then system send alert messages to farmer periodically.

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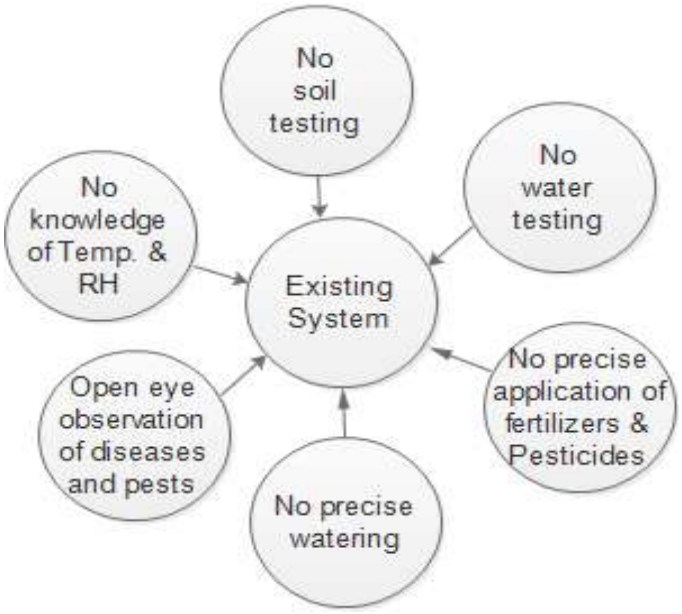

Figure1. Existing practices in agriculture

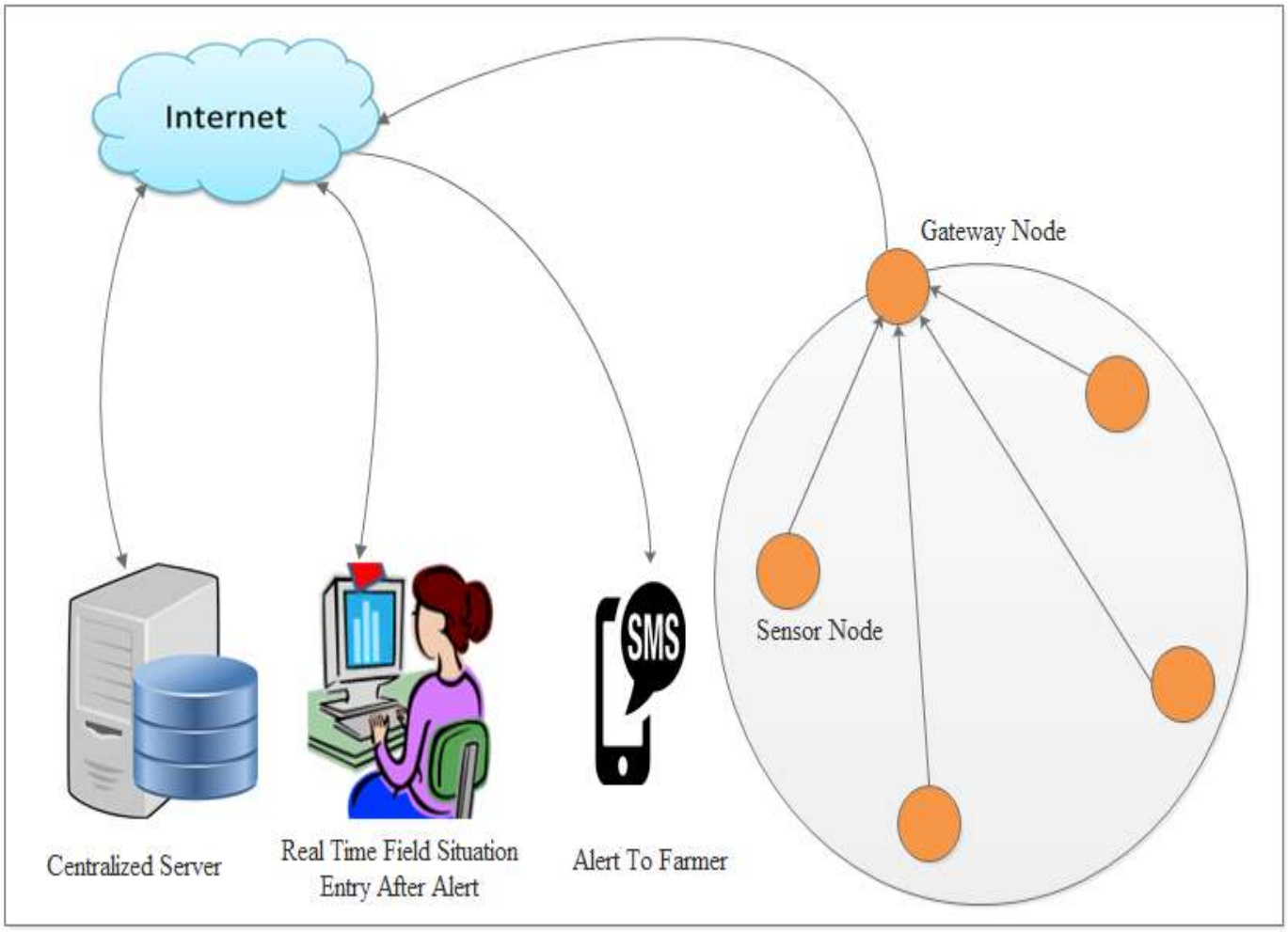

Figure 2. Architecture of system.

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The figure 1 shows the current agriculture practices followed and which need to be improved to overcome present challenges in agriculture. This will be improved by using WSN system. With on field WSN deployment farmer will get 24*7 real time field data. Also precise water irrigation is possible by reading soil moisture. As proper application of fertilizers and pesticides on time before attack of disease and pest is necessary those alert of disease or pest attack will be possible with WSN. So with help of WSN we can make number of task related to agriculture more precisely.

Tuan Dinh Le [5] proposed the implementation and deployment of wireless sensor network for precision farming. Using WSN, farmer can monitor various parameters such as soil moisture, light, PH, humidity etc. This data send to farmer after which farmer will take proper decision to increase productivity and quality of crop. The data prediction model achieve 77.5% accuracy for temperature and 67.6% accuracy for humidity prediction.

The state-of-the-art followed and upcoming challenges are discussed in [2]. Wireless sensor network is simple and easy to use system currently most preferred over the other in agriculture. To make existing WSN system more powerful cloud computing will be one of the best option. By doing integration of cloud computing with WSN user will get more processing power, proper data storage and analysis of collected data.

A. K Tripathy [1] used wireless sensor network for groundnut crop. Experiment conducted for various seasons as well as constantly number of year to get more precise information. Real time temperature, humidity and leaf wetness etc. data captured through on field sensors. Finally they carried out data mining on collected data and suggested patterns for groundnut crop. A overview of zigbee based wireless sensor network is provided in [12]. WSN for green house management is discussed in [6].

III. ARCHITECTURE

Figure 2 shows architecture of WSN system. It consists of on field sensor nodes, gateway node, user, internet connectivity and centralized server. Nodes are deployed on field according to requirement so that it will cover all field as well as collect data from all area. It will collect the data according to time quantum constraint specified. Captured data is passed to gateway node which then forward it to the centralized server. On server there are number of algorithms running according to requirement of system. If certain specified constraint are true the alert to the user will be send as SMS. In this specified architecture user also allowed to give the feedback about system when alerted him by SMS. This will help to improve the system further. On server analysis of data done by using different data mining techniques or with the help of expert. That advice will be suggested to the user to improve his currently followed practices. So it helps to produce more quality production from the farm with optimal usage of resources and avoids economical loss of farmers.

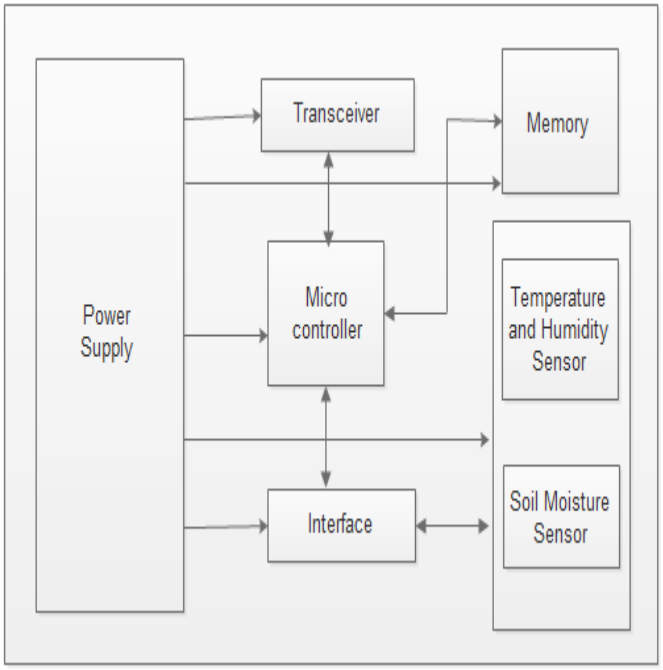

Figure 3 Sensor node structure.

Figure 3 shows the structure of sensor node. Its major components are transceiver, memory, microcontroller, power supply, interface and sensors according to requirement of user. Sensed data will be processed by microcontroller. Small amount of memory available that is used as temporary storage for data. Transceiver doing the task of receiving as well as forwarding data. We can provide power supply in different form such as battery, solar etc. Interface unit helps to have communication between different entities. We can provide different sensor on node according to requirement of the system.

As irrigation water and soil nutrient are also major components in the growth of crop those also be managed with the help of sensors. Soil moisture sensor give precise reading of soil moisture after specified time quantum. If level of water is outside the specified range, farmer will be alerted to start water irrigation pump. So crop getting optimal amount of water and soil nutrient gets available properly when irrigation water supplied exactly.

IV. CONCLUSION

This paper discussed different practices followed globally in wireless sensor network for precision agriculture. Due to dynamic climate change farmers facing number of problems. The traditional followed practices are not working under the current scenario, which needs to improve. Sustainable agriculture practices will help to balance the demand of food as well as it is handling natural resources properly.

As future scope in this system is to develop system which is having low cost, scalable and easy to use to the farmers especially from developing countries. Also big data, cloud computing and IoT will help further to become system more precise, reliable and automated.

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