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Automated Information System for Improved Crop Management

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***Abstract* — Precision agriculture an advanced technology is used to enhance crop production and improve quality of crop. The proposed system is an attempt towards the automated crop suggestion. It uses the wireless sensor network (WSN) in the area of agriculture. The proposed system has two main components, a hardware which includes sensors that record the environmental parameters soil moisture, humidity, soil temperature and software, Smartphone application that links to data server in order to process and analyze the information. The sensors are deployed in the crop field of grower to get the parameters, soil temperature, soil moisture and humidity. This real time information is collected by wireless sensors and it is transmitted to web server. The required parameter information for the crops is available in the database at the server. The proposed system will compare the received parameters with required parameters and accordingly suggest the crop to the grower.**

***Keywords* — Crop Management, Precision Agriculture, Wireless Sensor Network.**

I. INTRODUCTION

Agriculture is very important to most of developing countries in the world. India is one of them. Agriculture is the important occupation of the Indian families. Today, India is a second large country in world agriculture. The percent of agriculture in GDP in India is 13.7% in 2013, about 50% of total workspace [1]. Agriculture is demographically the broadest economic sector and plays a significant role in the overall socioeconomic fabric of India.

Nowadays, tools and technologies are used in agriculture to improve the efficiency and quality of production and reduce the impact of the environment on the crop. Due to successful development of 3s technology (GIS, GPS and RS), precision agriculture has emerged in the past few years [2]. Precision Agriculture (PA) is as the art and science of using advanced technology for enhancing the crop production. It uses information technology for ensuring that crops and soil receive exactly what they need for enhancing the production. Its goals are to ensure profitability protection of the environment and sustainability [3]. The precision agriculture collects the real-time data on weather, soil and air quality and to monitor crop and help farmers to take the best decisions about planting, fertilizing and harvesting crops.

Recent technologies in wireless communications and electronics have brought the Wireless Sensor Network (WSN) into reality which increases the growth of low cost, low power and multiple functional sensors that are small in size and communicate in short range. They provide opportunities to monitor and control homes, cities, crops and the environment .A Wireless Sensor Network is a collection of a large number of sensor nodes, which are working together and collect information and transmit this data to the base station via communication channel [4]. The wireless communication channels are Bluetooth, WI-FI, ZigBee. Each channel has different properties and capabilities such as data rate, range and cost. The following figure 1 shows the architecture of Wireless Sensor Network (WSN):

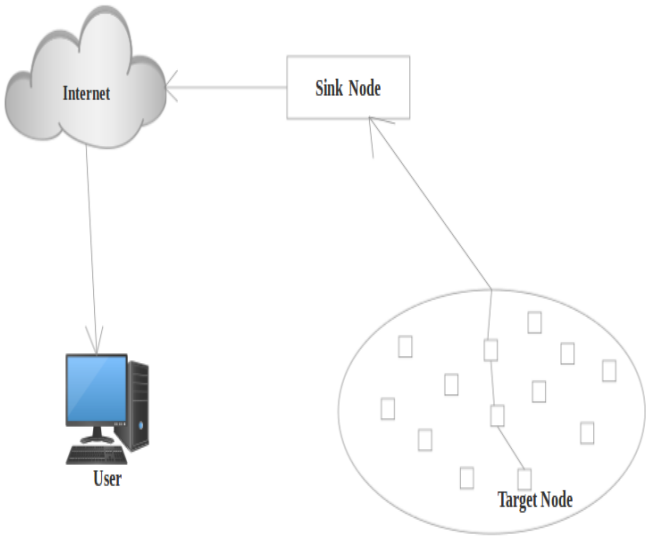

Fig.1. WSN architecture

By the observation we know that farmer faces huge financial loss because of wrong predictions of weather and incorrect irrigation method for crops. The major problems are less knowledge of soil content, types of soil, less knowledge about which fertilizers used in each condition, the amount of irrigation and its water capacity etc. This problem is overcome by using WSN in agriculture [5].

The WSN technologies are the greatest driver of development of precision agriculture. The wireless sensors are deployed in the field to collect the real-time data of environmental parameters such as soil temperature, soil moisture, humidity, air temperature. The Arduino is consisting of microcontroller set on a circuit board; it is fitted with sockets to allow connection with external devices with digital and analogue input and output [3]. The ZigBee used for the transferring of data from sensor node to the user's android application. The system has the following functions:

- Sensing
- Networking
- Analyzing
- Application

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II. Literature Survey

There is growing concern by governments, retailers and consumers about the safety and quality of food. If food safety is concerned, it is related to the growth of crops. As we know not all crops can grow on the same kind of soil, each crop has their own specific requirement. What kind of pesticides and fertilizers were used at the time of growth of the crop is directly related to the food safety. This paper presents principles of good agricultural practices (GAP) for environmental safety. The concept of technology developed in the framework of precision agriculture, including automation and robotics, make it possible to produce with a minimal environmental impact and at the same time all treatments and handling are recorded and can be uploaded in different databases which are used to observe the data related to crop. This data is used while generating any automation system. The paper produces an indirect method to reflect soil organic matter and moisture content. Good agriculture implies that the correct dose of fertilizer at the correct moment in correct way produces maximum output. The paper only gives information related to crops and the environment. It presents the only idea related to the project but implementation idea is not mentioned [6].

As discuss above it is not a good idea to grow all kinds of crops in any environment. The paper presents the concept of precision agriculture. Precision agriculture can be considered as the art and science of using advanced technology to enhance crop production. The paper proposes the concept of real time data enhancement and improved crop management. To improve the crop growth the paper presents one concept which uses sensors to analyze various components related to soil and atmosphere like soil temperature, soil moisture or air humidity, and passes that data to a base station via an Arduino. The data are then comparing with the data already stored in the database. The system suggests the crop which will be best suited for the farm. This system helps improving crop production. The system uses Bluetooth as transmission media, which can be accessible within the limited distance area [3].

This paper presents precision agriculture management, integrated system architecture based on CPS design technology. CPS is an important factor in precision agriculture and expected to improve productivity in order to feed the world and prevent starvation. Cyber-physical systems are the product of transdisciplinary engineering design process Mechatronics which completes software, electronics, computer and motor control. This system involves a high degree complexity of numerous spatial and temporal scales. Provide low cost solution to farmers that can be easily implemented in practice. It is possible to obtain large and quality productions because of the integrated management system. Optimizing the fertilizers and pesticides by knowing the right doses and moments when to be used. This system is successfully implemented only for Potato crop [7].

To ensure the quality of agricultural production land monitoring is an important but little critical task. Land monitoring is the concept which includes the collection of a set of measurement in a given field. These measurements will be analyzed and further actions will be taken to increase crop production. This paper presents the concept of an increment deployment solution INCOME which analyzes the result based on current conditions, no prior knowledge is required to calculate the result [2].

Due to the wrong prediction of whether farmers go bear huge loss. This paper presents an idea to provide a better suggestion and solution to farmers with the help of wireless sensor networking concept. The major problem in farming is that farmer has less knowledge of soil and other related parameters. The system uses wireless sensors to calculate various parameters from the soil and atmosphere. The system is developed for sugarcane crop which provides detail information related to sugarcane crop. The system uses ZigBee to transfer data from sensors to the base station [5].

III. Proposed System

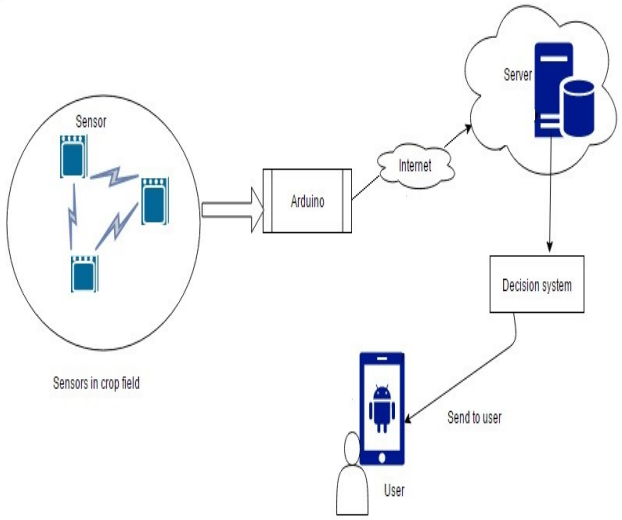

Fig.2. Architecture of proposed system

The Figure 2 shows the model of the proposed system. It had main elements:

1. A sensor nodes
2. Smartphone
3. Database
4. Communication channel

These components work together to generate a decision making system to monitor a crop field. The system is scalable and it was possible to include more sensors and use different channel for communication purpose.

The sensor node is a basic unit of the system. It records the environmental parameters such as soil temperature, soil moisture, humidity and air temperature. These measured parameters are into a voltage signal and digitizes it to produce digital output for processing. The microcontroller controls all functions of sensors and sends collected data to the server.

This data is uploaded on the server. The required parameter information for the crops is available in the database on the server. The decision system compares the

received parameters with the required parameters and accordingly suggests the crop to the user on his Smartphone.

IV. Conclusion

A smart application will be developed which is useful in the field of agriculture. The proposed system uses wireless mechanism for sending data to central server which collects and stores data and also performs analysis on it.

Wireless sensor network plays an important role in Automated Information System for Improved Crop Management. It is an efficient and reliable system for effectively monitoring environment parameters. It can reduce the human efforts but it is required to check updates.

References

[1] http://www.importantindia.com/4587/importance-of-agriculture-in-indian-economy/

[2] Shanshan Li, Shaoliang Peng, Weifeng Chen, Xiaoping Lu. *" INCOME Practical land monitoring in precision agriculture with sensor networks."* Elsevier Science Publishers, Computer communication 36(2015) pn. 459-467.

[3] F.J. Mesas Carrascosa, D. Verdu Santano, J.E. Merono, M. Sanchez de la Orden, A. Garcia Ferrer *"Open source hardware to monitor environmental parameters in Precision Agriculture"* Elsevier Science Publishers, Bio system Engineering I37 (2015) pn. 73-83.

[4] Yingli Zhua*, Jingjiang Songa , Fuzhou Donga *"Applications of wireless sensor network in the agriculture environment monitoring"* Science Direct, Procedia Engineering 16 (2011) 608 – 614.

[5] Arjum Awasthi, S.R.N Reddy. *" Monitoring for Precision Agriculture using Wireless Sensor Network-A Review"* Global Journal of Computer Science and Technology Network, Web and Security, vol 13.

[6] Josse De Baerdemaeker *"Precision Agriculture Technology and Robotics for Good Agricultural Practices "*Ku Leuven Department of Bio system..

[7] Cyprian Radu RAD, Olimpiu HANCU, Ioana Alexandra TAKACS, Ghelorghe OLTEANU. *" Smart Monitoring of Potato Crop: A Cyber-Physical System Architecture Model in the field of Precision Agriculture"* Science Direct, Agriculture and Agriculture Science Procedia 6.

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