iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** XII **Month of publication:** December 2022

DOI: https://doi.org/10.22214/ijraset.2022.47936

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue XII Dec 2022- Available at www.ijraset.com

A Review of Wireless Sensor Networks in Agriculture

Nifasath Piyar S[1], Dr. S. Baulkani[2]
[1, 2]*Department of Electronics and Communication Engineering, Government College of Engineering, Tirunelveli*

Abstract: ***Wireless sensor network (WSN) contains various sensor nodes with the capacity of sensing, computing, and wireless communications. WSN technology is used to control and monitor the environmental and soil parameter in agricultural field. WSN employ as a part of agriculture for few reasons like gives high interpretation, increase the production of the crop, low-power consumption and gather distributed data. Efficient management of water assumes an important part in agriculture. Various agricultural parameters like soil moisture, atmospheric temperature and humidity etc. are monitored and controlled by Monitoring and Controlling Units. WSN have fascinated much attention in various research areas like health care monitoring, environment monitoring and structural health monitoring. Recently WSN is widely used to provide solution on precision agriculture to overcome various problems in the real-world (field).This paper reviews the monitoring of precision agriculture using wireless sensor network focuses on literature of the development of a wireless sensor network on agricultural environment to monitor environmental conditions and deduce the appropriate environmental and agriculture. Agriculture and farming is one of the industries which has recently started using WSN to increase the productivity and standardize the agricultural yield at affordable cost.***

Keywords: Wireless Sensor Networks, Precision Agriculture, Fertilizer usage, Smart farming, Decision Making Systems.

I. INTRODUCTION

Around half of the population of India depends on farming. Farming in India is currently non-remunerative because of the lack of availability of funds, farm necessities, and lack of support for the productivity [1]. Although India is among the biggest producers of agricultural yield, holds only 33% of the farm productivity world over.

This needs to be increased so that farmers can get more remuneration from the same piece of land with less labour. Precision agriculture (PA) may provide a way to achieve it by the use of Global Positioning Satellite (GPS) for precise mapping of farms and with appropriate software the farmer is informed about status of his crop and which part of the farm requires inputs like water, fertilizer and pesticide etc.

The Precision Agriculture is defined as the technique of applying the right amount of input (water, fertilizer, pesticides etc.) at the right location and at the right time to enhance production and improve quality, while protecting the environment [3]. Most of the Precision Agricultural application uses WSN for data collection in agricultural field. This collected data is sent to a local or remote server where the computational and storage power is available.

This data is then processed, analysed in the server. Based on the interpretation of the data farm equipment can be controlled in real time.

II. SURVEY OF TECHNICAL PAPERS

A review of theme related technical papers is as follows:

A. The Realization of Precision Agriculture Monitoring System Based on Wireless Sensor Network

This survey introduces the theory of the monitoring system, and discusses the aspect of hardware and software design of the composed modules, network topology, network communication protocol and the present challenges. Experiments show that the node can achieve agricultural environmental information collection and transmission. The system has the feature of compact in frame, light in weight, steady in performance and facilitated in operation.

It greatly improves the agricultural production efficiency and automatic level drastically. The design and implementation of novel wireless sensor network for monitoring agricultural environment and evaluated the reactivity, robustness and longevity of the network in the field. Compared with the traditional agriculture, the system greatly improves agricultural production efficiency [1].

©IJRASET: All Rights are Reserved

B. Precision Agriculture Monitoring Framework Based on WSN

This survey presents the iFarm framework system, an easy-to-use and expandable agricultural monitoring solution to enhance land productivity by better managing water, improving the socio-economic factor of farmers and their awareness, predicting and planning the crop yields.

The iFarm system proposes WSNs as a promising mechanism to agricultural resources optimization, decision making, and land monitoring. WSNs make it possible to know at any time information about the land and crop conditions, so that farmers can be assisted with various notifications and suggestions during their farming tasks. It addresses the advantage of the precision agriculture approach to help making valuable decisions which could not only improve the land productivity but also optimize the use of resources. It gives a description of the precision agriculture monitoring approach that provides meaningful services to farmers. The use of wireless sensor networks in the precision agriculture has been introduced by presenting the design and architecture of a precision agriculture monitoring system.

The iFarm system has been discussed from the perspective of agricultural productivity, architecture, features, and main functionalities.

The iFarm offers a set of services to farmers including the irrigation and water management, the pest and diseases control, the crop yield prediction and planning, and the resources optimization. The iFarm system provides notifications using the website and SMS only, but we are currently working on the text to speech translation and voice messages [2].

C. Precision Agriculture Using Wireless Sensor Network System: Opportunities and Challenges

The paper reviews on the WSN system developed in this project is for use in precision agriculture applications, where real time data of climatological and other environmental properties are sensed and control decisions are taken based on it to modify them. Farmers depend heavily on the rains because they lack the access to irrigation facilities. Their crop yields are highly unreliable due to the variability in both rainfall amount and its distribution. Also these farmers depend heavily on the prediction values of various factors such as weather, water, soil, etc.

Agriculture faces many challenges, such as climate change, water shortages, labour shortages due to an aging urbanized population, and increased societal concern about issues such as animal welfare, food safety, and environmental impact. Sensor network and other agricultural techniques might help them to store and utilize the rain water, increase their crop productivity, reduce the cost for cultivation and make use of real time values instead of depending just on prediction. The basic aim here is to transport the Indian farmer from prediction to the exact values which are beneficial for their farms [3].

D. Wireless Sensor Networks In Precision Agriculture

We present the initial setup of the Lofar Agro project that concentrates on monitoring micro-climates in a crop field. In addition to the agronomic experiment, Lofar Agro aims at gathering statistics on the wireless sensor network itself. These statistics will form the basis for simulations of algorithms in wireless sensor networks and will be distributed [4].

E. Energy-Efficient Wireless Sensor Networks for Precision Agriculture: A Review

This review outlines the recent applications of WSNs in agriculture research as well as classifies and compares various wireless communication protocols, the taxonomy of energy-efficient and energy harvesting techniques for WSNs that can be used in agricultural monitoring systems, and comparison between early research works on agriculture-based WSNs. The challenges and limitations of WSNs in the agricultural domain are explored, and several power reduction and agricultural management techniques for long-term monitoring are highlighted [5].

F. Application of Wireless Sensor Networks for Greenhouse Parameter Control in Precision Agriculture

In this paper, we have proposed and analyzed the use of Programmable System on Chip Technology (PSoC) as a part of Wireless Sensor Networks (WSN) to monitor and control various parameter of green house. In green house technology, more number of the parameters is to be control because, the varieties of the crop are large.

They are increasing day by day because of the development in agriculture technology. In this situation, the wireless sensor network with additional hardware and software is an efficient solution for green house control.

Experimentally it is proved that the hardware develop by Cypress Inc. is the best solution which works on low power with less complexity and high reliability for greenhouse control [6].

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

G. Wireless Sensor Network in Precision Agriculture Application

This approach provides real-time information about the lands and crops that will help farmers make right decisions. Using the basic principles of Internet and WSN technology, precision agriculture systems based on the internet of things (IOT) technology is explained in detail especially on the hardware architecture, network architecture and software process control of the precision irrigation system. The software monitors data from the sensors in a feedback loop which activates the control devices based on threshold value. Implementation of WSN in PA will optimize the usage of water fertilizer and also maximized the yield of the crops [7].

H. Agriculture Field Monitoring using Wireless Sensor Networks to Improving Crop Production

The purpose of this paper is to design and develop an agricultural monitoring system using wireless sensor network to increase the productivity and quality of farming without observing it for all the time manually. Temperature, humidity and water levels are the most important factors for the productivity, growth, and quality of plants in agriculture. The temperature, humidity and water level sensors are deployed to gather the temperature and humidity values. The sensor has to transmit the gathered information through the wireless communication network to the data server (cloud).

The IOT gateway is in charge of the communication between the remote control serial devices and central control system. The farmers or the agriculture experts can observe the measurements from the web simultaneously. With the continuous monitoring of many environmental parameters, the grower can analyze the optimal environmental conditions to achieve maximum crop productiveness, for the better productivity and to achieve remarkable energy savings. This paper presents a crop monitoring system based on wireless sensor network.

IoT has important significance in promoting agricultural information. A RM 7 processor is integrating with the sensors (temperature, humidity and water level) used for agriculture monitoring and crops production. Depending upon the threshold value motor is controlled automatically. The monitored crop details are uploaded to the cloud via the IoT gateway. Hence the farmers can easily to access and control the agricultural production, whereas saving the input materials, improving efficiency, productivity and profitability in farming production system [8].

I. Application of Wireless Sensor Networks in Precision Apiculture

This paper introduces a wireless sensor network system for bee colonies online monitoring. The developed wireless system consists of several wireless measurement nodes which transfer colony data to one main unit, which then sends the received data to the cloud database server. Users can see and analyze data using the developed Web system. To this moment temperature and humidity are monitored using the SHT15 sensor.

Real time temperature and humidity monitoring of the bee colonies can provide the beekeeper with actual and timely data and information to help identify various states of the bee colonies. Due to the fact, that these sensor data are transmitted wirelessly, it is also easier for the beekeeper to set up such a system [9].

J. Wireless Sensor Networks: A Survey

This paper analyses commercially (and research prototypes) available wireless sensor nodes based on the parameters like range, antenna type, target technology, components, memory, storage, power, life time, security, computational capability, communication technology, power, size, programming interface and applications and outlines research directions in this area. The WSN technology was surveyed. The WSN mode evaluation based on its key technical specifications was also represented. Although researchers have already designed a number of network configurations like heterogeneous and single-hop which uses WSN technology but in such configurations most of the processing is carried out at the server end [10].

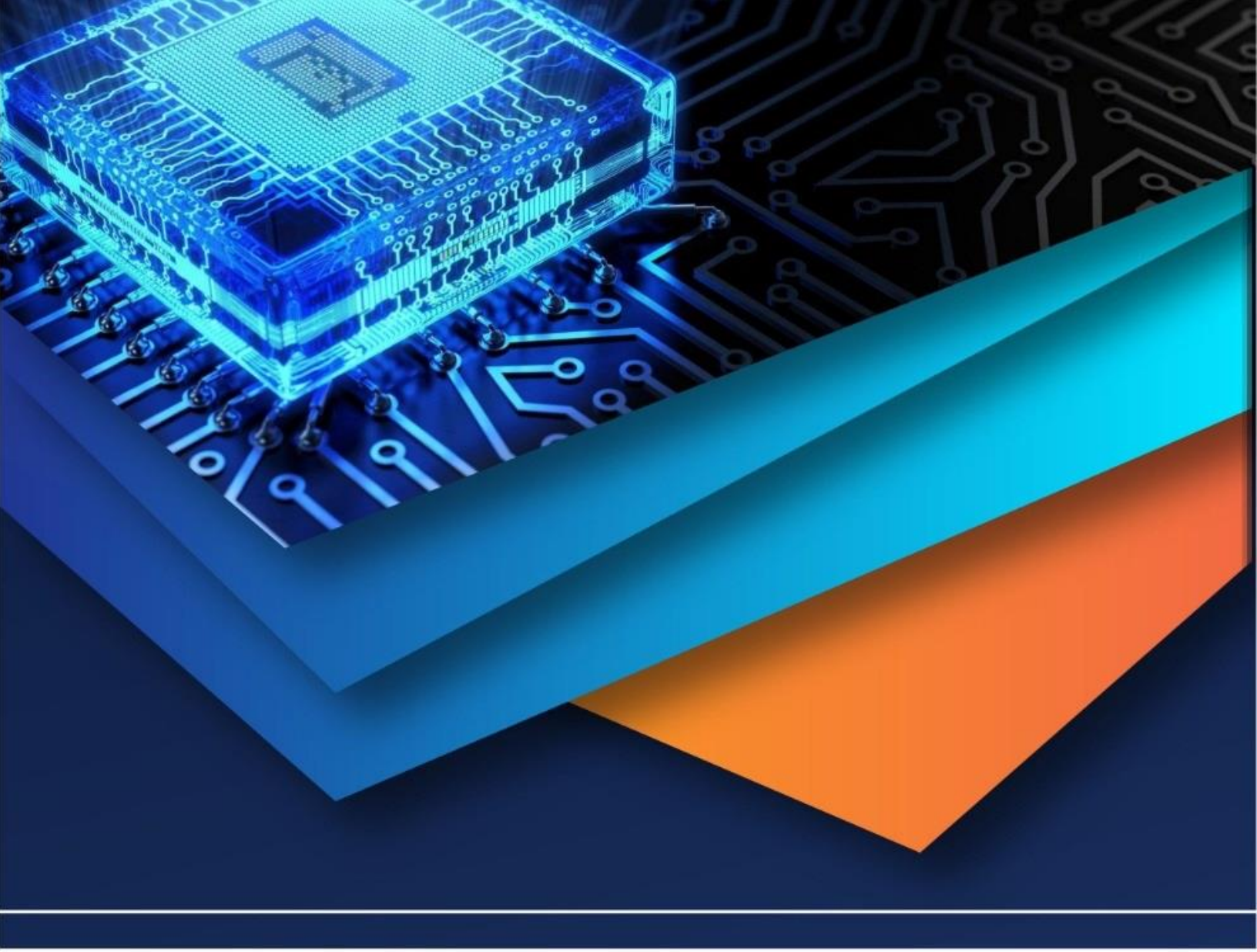
III. CONCLUSION AND FUTURE WORK

The applications of sensor networks are increasing in higher speed day by day. This paper presents a brief literature review on precision agricultural monitoring system based on wireless sensor network. Wireless monitoring in the agricultural field not only allows user to reduce the human power, but it also allows user to see accurate changes in the agricultural productivity. Use of precision agriculture is increasing day by day because of the development in WSN technology and IOT and its adaption in smart farming. The future work is analyze the captured data using machine learning algorithms for the effective prediction of crop suitable for the environmental conditions and also the crop yield.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

REFERENCES

[1] N. Chen, X. Zhang, and C. Wang, "Integrated open geospatial web service enabled cyber-physical information infrastructure for precision agriculture monitoring," Computers and Electronics in Agriculture, vol. 111, pp. 78–91, 2015.
[2] Yassine Jiber, Hamid Harroud, Ahmed Karmouch. Precision Agriculture Monitoring Framework Based on WSN, IEEE Conference on 2011 June.
[3] Manikandan .S.V 1, Jayapriya .P 2. Precision Agriculture Using Wireless Sensor Network System: Opportunities and Challenges, International Journal Of Engineering And Computer Science ISSN: 2319-7242 Volume 5 Issue 11 Nov. 2016, Page No. 19108-19115.
[4] Aline Baggio. Wireless sensor networks in precision agriculture, IJ APA in Volume 23, 2014.
[5] Haider Mahmood Jawad 1,2 , Rosdiadee Nordin 1 , Sadik Kamel Gharghan 3, Aqeel Mahmood Jawad 1,2 and Mahamod Ismail 1. Energy-Efficient Wireless Sensor Networks for Precision Agriculture: A Review, Sensors 2017, 17, 1781; doi: 10.3390/s17081781.
[6] D.D.Chaudhary 1, S.P.Nayse 2, L.M.Waghmare 3. Application of Wireless Sensor Networks for Greenhouse Parameter Control in Precision Agriculture, International Journal of Wireless & Mobile Networks (IJWMN) Vol. 3, No. 1, February 2011.
[7] Mohamed Rawidean Mohd Kassim, Ibrahim Mat, Ahmad Nizar Harun. Wireless Sensor Network in Precision Agriculture Application. WSN in IJ of Agricultural and Greenhouse, Volume 12 2011.
[8] J.Infantial Rubala 1, D. Anitha 2, PG Student 1, Assistant Professor 2. Agriculture Field Monitoring using Wireless Sensor Networks to Improving Crop Production. International Journal of Engineering Science and Computing, March 2017.
[9] Armands Kviesis 1, Aleksejs Zacepins 1, Mahmut Durgun 2, Saban Tekin 3. Application of Wireless Sensor Networks in Precision Apiculture, ENGINEERING FOR RURAL DEVELOPMENT Jelgava, 20.-22.05.2015.
[10] Vidyasagar Potdar, Atif Sharif, Elizabeth Chang. Wireless Sensor Networks: A Survey, 2009 International Conference on Advanced Information Networking and Applications Workshops.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)