# REVIEW ON AGRICULTURE FIELD MONITORING USING WIRELESS SENSOR NETWORK

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*Abstract*—**The main purpose of this paper is to develop an agriculture monitoring system using Wireless sensor network (WSN) that is an upcoming concept to improve the productivity and quality of farming. The wireless sensor network is a new concept that provides a processed real data by sensor nodes which physically dispersed in the area. Temperature, humidity and moisture grade system provision spirit level are the most important factors for the productivity, growth, and quality of works in agriculture. The sensing element has to transmit the gathered info through the wireless communicating electronic network to the data server. The Internet of Things (IoT) gateway is in the mission of the communicating between the remote constraint serial publication twist and central control system. With the help of wireless sensor network, we are able to obtain the values of moisture, humidity, and temperature as a simple device is required by which the farmers can measure all the various factors and check the value at the real time. In order to improve the efficiency of the data collection procedure in the agriculture field and also to improve the precision along with agricultural operations, it is necessary that to have an automated system that collects environmental data. With the continuous monitoring of many environmental parameters, the raiser can analyze the optimal environmental conditions to achieve maximum crop Cartesian productivity, for the better and to achieve remarkable energy savings.**

*Keywords*—**Wireless Sensor network (WSN), Agriculture Monitoring.**

## I. INTRODUCTION

Different fields of life are getting a great impact on the advancement of technology. Because of the expanded request for sustenance, individuals are attempting to put additional endeavors and extraordinary methods to increase the nourishment generation. Utilization of various advancements towards agribusiness is one of such endeavors. Aside from utilization of logical innovations in horticulture, data innovation is presently being intensely practiced here. Innovations like sensor arranging, network processing, universal figuring and the setting mindful registering are supporting side space for enhanced checking and basic leadership capacities [1].

The Farmers or experts in agriculture business can predict the estimations about the climate conditions such as temperature, humidity and moistness levels through the web. With the ceaseless checking of numerous natural parameters, the raiser can examine the ideal ecological conditions to accomplish greatest yield Cartesian productiveness, to improve things and to accomplish exceptional vitality funds. In addition, when a basic change in one of the estimations happens, at that point the rancher will be informed by means of email and SMS by the horticulture master. Along these lines, the agriculture ace can interact in such a significant situation at most provoke them conceivable and might have the ability to foresee conceivable unsafe effects of those movements [2].

### A. Precision Agriculture

Precision Agriculture includes wireless sensors to help in spatial information gathering, water system control demonstrates, arrangement for providing data to farmers, variable-rate innovation model, and greenhouse framework. In spatial information accumulation, versatile field information, procurement framework is accessible to gather valuable information for trim administration [3]. This framework can deal with a nearby field overview and gathers information about soil, water accessibility, biomass yield, soil compaction, soil richness, leaf territory list, leaf temperature, leaf chlorophyll content, neighborhood atmosphere information, creepy disorder weed invasion, plant water status, and yield of grain and so on.

A few techniques are accessible in exactness agribusiness to control and screen the required environmental parameters for the particular yield. It is particularly crucial to separate the procedures which can effectively manage the most ideal

condition. The usage of remote sensor composes of the broad zone is by and by getting the chance to be unmistakable in the nursery advancement of precision agribusiness. The parameters of the nursery to be controlled are extended well ordered so it may cause the data development and blockage in future [4].

## B. Wireless Sensor Network

A wireless sensor network is a framework that consists of radio frequency (RF) handsets, sensors, small-scale controllers and power sources. It uses various sensors to become a popular research in the agriculture. The Wireless sensor network is collecting, storing and sharing the data. The Latest advancement in remote sensor organizing innovation has prompted to the improving of minimal effort, low power, and multi-functional sensor hubs. Sensor hubs are empowering condition detecting together with information handling. Sensor systems are utilized for an assortment of utilizations which included remote information procurement, machine checking, and support, brilliant structures and interstates, natural observing, site security, the computerized nearby following of costly materials, well being administered, and in numerous different regions. A general wireless sensor network convention comprises of the application layer, transport layer, organize layer, information connect layer, the physical layer, control administration plane, portability administration plane and the errand administration plane [5].

**SERVER SIDE**
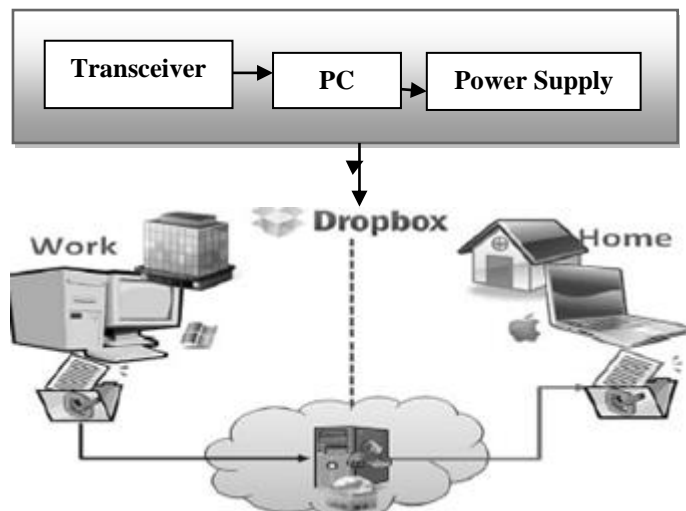


**CLIENT SIDE**

**Figure 1. ARCHITECTURE DESIGN**

Server Side*:* It collects values from the transceivers and data saved in the MICROSOFT EXCEL FORMAT and it is transferred to the client as mobile information using the Dropbox method. So it can retrieve data faster and for future references.

Client Side: At this site, the information is received and is preserved to the server that is a personal computer. Further, the real-time information or data transferred to the client through DROPBOX Sync. The method utilized between server and mobile.
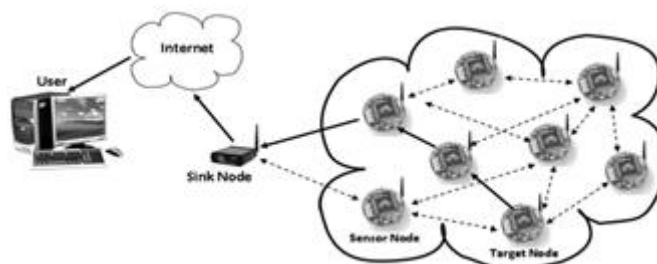


**Figure 2. Wireless Sensor Network [6]**

## C. Sensors

A detector converts the physical parametric quantity into a signaling which can be measured electrically. Wireless sensor network technology used various types of sensors in the agriculture has become a popular research. Today there is different sensor network is used to transmit and receive the data in monitoring system[20].

Types of sensor deployment in precision agriculture:-

1. TEMPERATURE SENSOR:-It is the instrumentation to measure the temperature or heat. The temperature sensor can be used to measure temperature with an electrical output. It is easy to use a sensor for measuring the temperature value of the soil or other material.

2. HUMIDITY SENSOR:-It is an integrated circuit that can be used to sense the weather to get an idea about the climate condition.

3. MOISTURE SENSOR:-Moisture sensor used to measure the water level in the soil. It is important for agriculture, environment to help the farmers manage their irrigation system. With the help of this, we are able to increase yields and quality of crops by better management [20].

## D. The significance of the Wireless Sensor Network

- Wireless transmission is noteworthy lessening and improvement in wiring and bridle.
- Wireless sensors permit generally inconceivable sensor applications, for example, observing unsafe, perilous, unwired or remote territories and areas. This innovation

gives boundless establishment adaptability to sensors and expanded system power.

• Wireless innovation decreases support many-sided quality and expenses.

• Wireless sensor systems permit quicker sending and established different kinds of sensors on the grounds that considerable a lot of these systems give self-arranging, self-designing, self-diagnosing and self-recuperating capacities to the sensor hubs.

• It enables MEMS (Micro-Electro-Mechanical Systems) sensors to be coordinated with flag molding and radio units to shape "bits" with to a great degree, minimal effort, and small size and low power prerequisite.

• The Majority of wireless sensors have flag molding and preparing units introduced in the area of the sensors and transmit motions in the computerized shape.[7]

**E. Importance of sensors in agriculture**

Sensors are utilized for gathering data about physical and natural qualities in organic farming while actuators are utilized to respond to the criticism to have control over the circumstances. The setting obtained gives a profitable commitment to displaying circumstances of spaces that have an assortment of time variation qualities. Agribusiness is one such space. [6].

The Agribusiness area represents a few prerequisites that are the following:

• Collection of climate, harvest and soil data.

• Monitoring of appropriate arrive.

• Multiple products on a single real estate parcel.

• Different fertilizer and water requirement to a variable bit of uneven lands.

• Diverse necessities of products for various climates and soil conditions

• Proactive arrangements conflicting to receptive preparations.

## II. LITERATURE REVIEW

B. Balaji Bhanu, et al., (2014) [11] The reason for this is to outline and build up a rural checking framework utilizing the remote sensor system to expand the profitability and nature of cultivating without watching it for all the time physically. Temperature, stickiness and carbon dioxide levels are the most essential elements for the efficiency, development, and nature of plants in horticulture. So this framework occasionally measures these parameters inside the fields, therefore the ranchers or the horticulture specialists can watch the estimations from the web at the

same time. Also, when a basic change in one of the estimations happens, at that point the rancher will be insinuated by means of versatile instant message and email by a horticulture master. With the nonstop checking of numerous natural parameters, the cultivator can break down the ideal ecological conditions to accomplish greatest yield productiveness, for the better profitability and to accomplish wonderful vitality funds.

Ning Wang, et al., (2006) [12] outlined latest improvement of remote sensor advances and models for remote interchanges as connected to remote sensors. Cases of remote sensors and sensor systems connected with farming and nourishment creation for ecological checking, exactness horticulture, M2M-based machine and process control, building and office mechanization and RFID-based traceability frameworks are given. They also discussed about points of interest of remote sensors and deterrents that keep their quick selection. At last, on the basis of examination of market development, the paper talks about future pattern of remote sensor innovation improvement in horticulture and sustenance industry.

Soled Escolar Diaz, et al., (2011) [13] proposed a procedure comprising of an arrangement of very much characterized stages that cover the total life cycle of WSN applications for agrarian observing. Precision agriculture is a field which gives a standout amongst the most appropriate situations for the sending of remote sensor systems (WSNs). The specific attributes of horticultural conditions – which may change altogether with area – make WSNs a key innovation ready to give precise learning to agriculturists. This information speaks to a significant asset since it empowers constant basic leadership with respect to issues, for example, setting up water sparing strategies while giving sufficient water system and picking the opportune time to gather the organic product in view of its development. The authors have examined distinctive existing true situations where WSNs are being connected. In light of this investigation, we have found that there exist critical shared traits yet no strategy that indicates the accepted procedures that ought to be utilized as a part of the general, edit autonomous case. The absence of a general strategy adversely impacts the measure of exertion, improvement time, and cost of creating applications.

G.V. Satyanarayan, et al., (2013) [14] proposed to configure, create and actualize a remote sensor arrange associated with a focal hub utilizing ZigBee, which thusly is associated with a Central Monitoring Station (CMS) through General Packet Radio Service (GPRS) or Global System for Mobile (GSM) innovations. The propelled improvement in remote sensor systems can be utilized as a part of observing different parameters in farming. Because of uneven characteristic appropriation of rain water, it is exceptionally troublesome for ranchers to screen and control the conveyance of water to agribusiness field in the entire homestead or according to the necessity of the harvest. There is no perfect water system strategy for every single climate condition, soil structure and assortment of

yields societies. Ranchers endure extensive money related misfortunes as a result of wrong predictions of climate and inaccurate water system techniques. In this specific situation, with the advancement of scale down sensor gadgets combined with remote innovations, it is conceivable remotely screen parameters, for example, moisture, temperature and mugginess. The framework likewise acquires Global Positioning System (GPS) parameters identified with the field and sends them to a focal observing station. This framework is relied upon to help agriculturists in assessing soil conditions and act as needs be.

Kavi K. Khedo, et al., (2010) [15] explored the utilization of Wireless Sensor Networks (WSN) for air contamination observing in Mauritius. Sensor systems are presently a dynamic research zone for the most part because of the capability of their applications. With the quickly developing modern exercises on the island, the issue of air contamination is turning into a noteworthy worry for the wellbeing of the populace. We proposed an inventive framework named Wireless Sensor Network Air Pollution Monitoring System (WAPMS) to screen air contamination in Mauritius using remote sensors conveyed in gigantic numbers around the island. The proposed framework influences utilization of an Air Quality To file (AQI) which is by and by not accessible in Mauritius. Keeping in mind the end goal to enhance the proficiency of WAPMS, we have planned and executed another information accumulation calculation named Recursive Converging Quartiles (RCQ). The calculation is utilized to consolidate information to kill copies, sift through invalid readings and condense them into a less difficult frame which fundamentally lessen the measure of information to be transmitted to the sink and consequently sparing vitality.

TABLE 1. COMPARATIVE STUDY IN VARIOUS SURVEY PAPERS

| Author Name | Method used | Parameters | Merits and demerits |
|---|---|---|---|
| Bhanu ,b.b., et al., 2014[11] | Efficient consumption | Ph value, temperature and date, IDI | Data acquisition has high accuracy<br><br>Storage capacity<br><br>Authentication purposes.<br><br>Limited battery life of nodes |
| Wang, N., et al., 2006 [12] | Data communication techniques (WLAN and Controller Area Network) | - | Fast adoption<br><br>Market growth<br><br>Supervisory level |
| Diaz, S. E., et al., 2011 [13] | The modern and traditional technique, energy saving and ((Routing techniques). | Lifetime, sensitive | Mobility and portability among different types of platforms (smartphones, mobiles, and laptops) |
| Satyanarayana, G, V. et al., 2013 [14] | Zigbee, communication protocol and GPRS and GSM | Temperature, humidity | - |
| Khedo, K. K., et al., 2010[15] | RCQ | Number of Area and running time | Smoke mission and other pollutants<br><br>Energy saving, low cost sensors |
| Zhenyu et al., 2012 [16] | View Mapping | Temperature | Agricultural crop Production |
| J. Dhivya et al., 2016 [17] | Probe system | Temp, Soil, and Light | Quite reliable and accurate |
| Gopala Krishna et al., 2013 [18] | Zi Zigbee | Accurate rate and | Optimum growth |

| | | consumes less power | conditions |
|---|---|---|---|
| Balaji Bhanu et al., 2014 [19] | Agricultural monitoring system | Energy | Optimal environmental conditions to achieve maximum crop productiveness |
| LI U Yumei et al., 2011 [20] | Zigbee, GPRS | Delay | Low cost, low power consumption, flexibility networking, without cabling, friendly interface |

## III. APPLICATIONS OF WIRELESS SENSOR NETWORKS IN AGRICULTURE

Organization of remote sensors and sensor arranges in agribusiness and sustenance industry is still toward the starting stage. Applications can be characterized into five classes: [7]

### A. Environmental Monitoring
Regardless of the fast advancement of PC innovation, field estimations of condition factors, for example, climate information and geo-referenced water quality information still relies upon stationary sensors and data-loggers, pencils and paper notepads, which are work concentrated and vulnerable to recording blunders amid interpretation [8].

### B. Precision Agriculture
Remote sensors have been utilized as a part of exactness horticulture to aid (1) spatial information accumulation, (2) accuracy water system, (3) variable-rate innovation and (4) providing information to farmers.

### C. Machine and process control—M2M
M2M is an innovation that backings wired or remote (WPAN, WLAN, cell frameworks, etc.) interchanges from machine to machine, from the machine to a portable or from versatile to the machine. M2M innovation enormously improves computerization of a framework (a machine framework, a procedure or a business) and incorporates discrete resources inside the framework with an IT framework. Today, this idea has been produced primarily for industry and organizations. Application cases of M2M in farming underneath can be ordered to (1) vehicle direction, (2) apparatus administration, (3) automated control and (4) process control, albeit none of these applications totally utilized M2M in its genuine sense.

### D. Facility Automation
Horticultural offices, for example, nurseries and a creature bolstering offices, incorporates HVAC, lighting control, vitality administration, get to control, basic checking and fire/security. Models for wired HVAC control frameworks have been set up for quite a while. Measures for remotely based frameworks are right now a work in progress.

### E. Traceability System (RFID)
With an expanding interest in security and wellbeing, finish documentation for sustenance items, from the field to the client, has turned out to be progressively requesting [9]. RFID has been acknowledged as another innovation for an all-around organized traceability framework for information gathering, human, creature, and item following [10].

## IV. CONCLUSION AND FUTURE SCOPE

Precision Agriculture involves wireless sensors to help in spatial data gathering, water framework control exhibit monitoring field conditions and is the establishment of present-day rural management. The agriculture monitoring system is a reliable and efficient system for agriculture parameters. The Wireless monitoring organization is not only allowing exploiter to reduce the human power, but they also allow to use see the accurate changes. In this most commonly used sensors are:- humidity, temperature and moisture sensors. The main focus is on accuracy agribusiness and the way in which remote system upgrade. Consequently, the essentialness of remote sensors is when all is done in farming and different utilization of remote sensor arrange in agribusiness. Moreover, the discussion on past research is done by specialists in the field of agribusiness observing.

In future work, a practical deployment (feasibility and simulation). Study the critical situation of sins' (sensor node) solving the issues of nodes, failure, self-recovery, and routing, etc. It will implement a routing protocol in the wireless sensor network (WSN) to enhance the performance metrics like as temperature, time consumption, and energy consumption. The sensor can be defined the real-time value

of the environment. With the help of these, we can increase the crop production and better growth of plants.

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